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Platers Gather at Washington for Annual Convention

Members from All States and Canada Attend Excellent Educational Sessions — Trips and Other Features Make Everybody Happy at the 18th Annual Convention of the American Electroplaters' Society in Washington, D. C., June 30-July 3

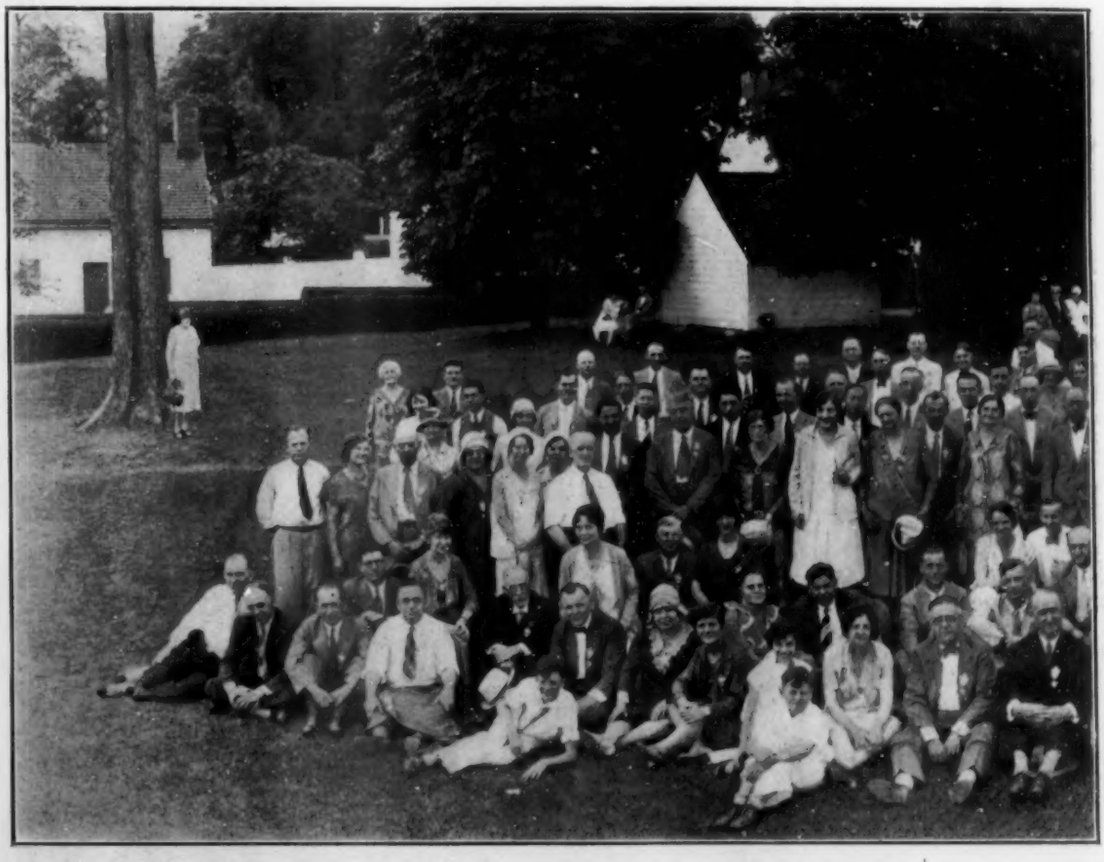
By DR. A. K. GRAHAM
Associate Editor

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY.

THE eighteenth Annual Convention of the American Electroplaters' Society is over. An excellent program interspersed with numerous social activities, and the enjoyable atmosphere of the nation's capital were more than enough to fully repay the two hundred and seventy members who attended with some eighty ladies and children, and to compensate for the summer heat and thunder showers which made a washout of the baseball game. It is putting it mildly to say that a very enjoyable time was had by everyone.

Sessions on Monday, June 30th

The Convention was officially opened at 10 A. M. Monday morning with Supreme President Horace Smith presiding. After a brief word of greeting from Mr. Tom



Platers and Guests at Mount Vernon. (See Pictures on Pages 320 and 321)

Slattery, president of the Baltimore-Washington branch, the following papers were presented.

Dr. R. W. Mitchell of the Magnus Chemical Company gave a very interesting lecture, illustrated, with experiments, on the Cleaning of Metal. He stated that a cleaner of low caustic content is frequently better than a more concentrated solution. He demonstrated the effectiveness of colloids as constituents of cleaners and called attention to the improvement in cleaning that can be obtained by controlling the pH of cleaning solutions within definite operating limits by means of buffer salts.

F. J. Liscombe, of the Hanson-Van Winkle-Munning Company, presented a paper entitled "The Introduction of Iron Into Alkaline Cleaning and Plating Solutions" in which he called attention to the undesirability of having acid radicals such as chlorides and sulphates present in the solutions because of their ability to dissolve iron from the anode in the case of cleaners or from steel plating tanks by electrolysis. Since it is difficult to eliminate such salts from some of the commercial constituents of cleaners, it was further stated that care should be taken to avoid having the steel tank in the circuit in order to prevent its being corroded.

C. H. Proctor of the Roessler and Hasslacher Chemical Company, speaking on the "Improvements of Black Rust Proof Finishes," gave the following formula for producing a black finish on zinc by immersion: Nickel chloride, 4 ounces; ammonium chloride, 6 ounces; sodium sulpho-cyanide, 2 ounces; zinc chloride ½ ounce, and water one gallon. A satisfactory zinc deposit was obtained from the following recommended solution: Sodium cyanide, 4 ounces; zinc cyanide, 5 ounces; caustic soda, 4 ounces; water, one gallon, and a small quantity of mercury as brightener, if desired.

A paper on "The Deposition of White Cobalt—Nickel Alloys," by Dr. C. G. Fink and K. H. Lah, of Columbia University, was presented by the latter author. It was stated that a solution consisting of from 2 to 5 ounces of cobalt with approximately the same quantity of nickel, 1½ ounces of sodium chloride, 3 to 4 ounces of boric acid and one gallon of water, when operated at 120° F., not over 19 amperes per square foot and a pH of from 4 to 5 gave very satisfactory deposits of a whiteness equal to silver. Pure nickel anodes were used and cobalt was added to the solution. An alloy containing 25 per cent or more of cobalt is stated to have the hardness three times that of pure nickel and 50 per cent of cobalt offers the greatest resistance to corrosion.

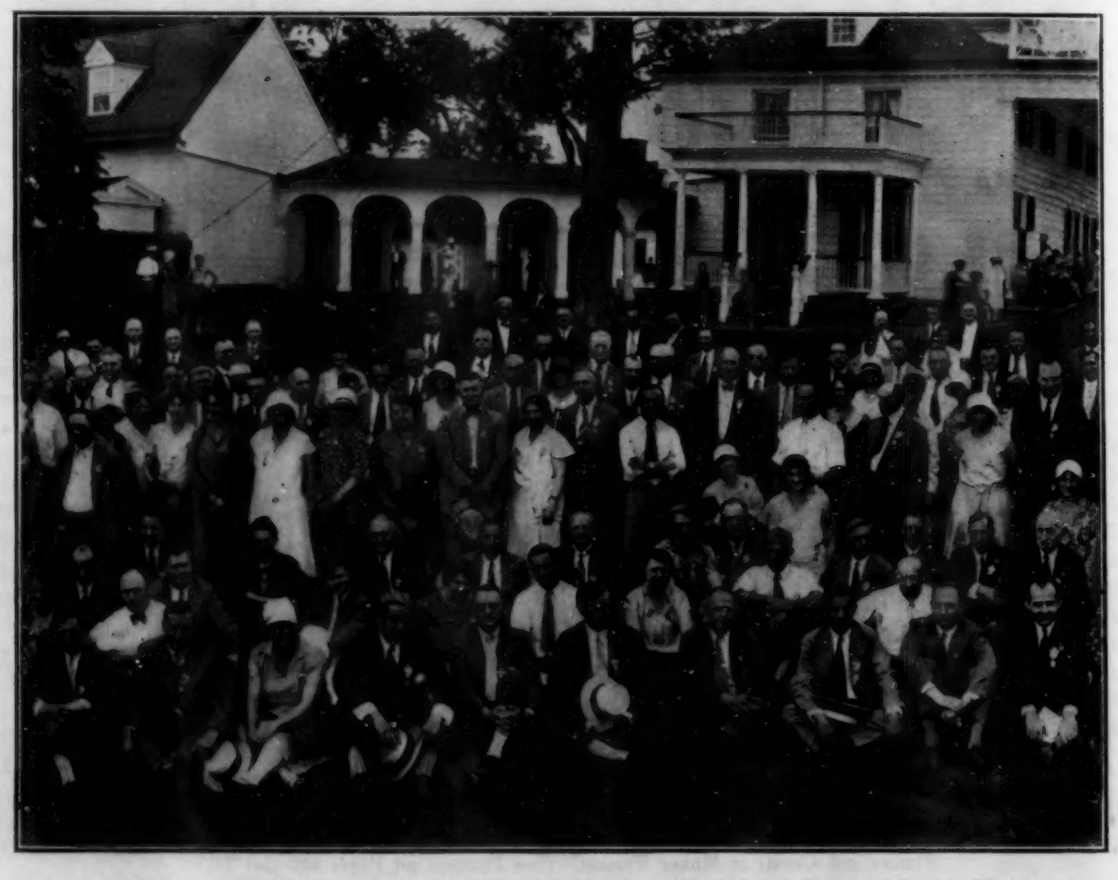
R. V. Kirk of the Roxalin Flexible Lacquer Company spoke on "Practical Lacquer Valuation From the Plater's Standpoint." He stated that among other things, the adhesion, flexibility, body and resistance to spotting out of clear lacquers are highly important properties, and he gave simple tests by which the plater could evaluate them. He spoke further on lacquer enamels and explained how chipping and flexibility could readily be tested in the plant.

After luncheon at the Hotel the members and guests took buses for a sight-seeing trip of the city. Some few, on the time-worn excuse of a sick grandmother, sneaked off to the ball game and saw Washington win a two-to-one ninth-inning victory over St. Louis. Our good friend George Hogaboom who doesn't profess to be a gambler won the stakes by guessing the closest score.

On Monday evening the preliminary business of the Society was transacted in order to afford more time on Thursday at the regularly scheduled business meeting.

Sessions on Tuesday, July 1

K. Pitschner of the Firestone Steel Products Company presented the first paper at the Tuesday morning educational session, presided over by C. E. Van Derau, Vice President of the Society. Under the title "The Buffer



More of the Convention People. In the Background Is the Beautiful Colonial Home of George Washington

Properties of Nickel Plating Bath," Mr. Pitschner called attention to several interesting facts. It was found that by increasing metal content from 4 to 8 ounces per gallon, ammonium chloride concentration from 2 to 4 ounces per gallon and boric acid beyond 4 ounces per gallon, the solution was more strongly buffered. Boric acid below 4 ounces per gallon, where the electrometric pH was 5.5, exhibited little buffer action, while at a pH of 6 the buffer action of 4 ounces per gallon was about three times the value at the lower pH.

H. W. Faint of the Chicago Branch presented a paper written by W. Lockerbie on "Effects of Acids and Alkalis on the pH of Nickel Baths." In this work the author studied the effects of different acids and alkalis on nickel baths, using the Sizelove method of titration with methyl red as described in a recent article in THE METAL INDUSTRY.

A paper by H. D. Mougey and W. N. Phillips of the General Motors Corporation on "The Deposition of Nickel at a Low pH" proved of considerable interest and brought forth a great deal of discussion. In this paper the authors experimented with Watts' nickel solution at pH's from 60 down to 1, at varying temperatures and current densities. They found that there are apparently two ranges of pH, from 5.5 to 6.0 and from 1 to 2, within which very satisfactory plating can be obtained. At the lower pH value, operating at 35 to 40 amperes per square foot and a temperature of about 120° F., on a plant scale with a solution of the Watt type, but carrying approximately 8 ounces of metal per gallon, a very rapid gain in the rate of deposition, better anode corrosion, complete maintenance of metal in the solution from the anode, relatively no pitting after the solution had been operated for some time and deposits of very satisfactory character were claimed. It was stated that under the conditions just described, the cathode efficiency was approximately 70 per cent. It was further emphasized that as the temperature varied, the appropriate current density must also be varied.

George B. Hogaboom of the Hanson-Van Winkle-Munning Company gave a very interesting talk entitled "Anode Rods." Mr. Hogaboom emphasized the necessity of maintaining clean anode rods and good contact between all anodes in a given plating bath. He illustrated by samples of anodes and slides how very non-uniform anode corrosion results when any anode has a different voltage drop across the solution due to poor contact of any kind.

These papers were then followed by a round table discussion by manufacturers and users on the subject of Nickel Anodes. The consensus of opinion appeared to be that the highest purity nickel anode was most desirable, that many of the difficulties experienced with anode corrosion could be traced directly to improperly controlled factors, such as solution compositions, temperature, anode current density, and general plating control, and that with properly controlled plating conditions the high purity anode, particularly of the depolarized type, was the most satisfactory.

The afternoon trip to the Navy Yard was somewhat delayed by heavy showers but those who braved the weather were afterwards repaid by a most interesting exhibit of chromium plating of the inside of various sized guns. After inspecting other departments of the yard a picnic luncheon was served during which time the songs and stories of Dr. Blum and others furnished plenty of amusement.

Tuesday Night Session

At the Educational session on Tuesday evening J. R. Kennedy served as chairman and turned the meeting over to Dr. Blum who had taken charge of arranging the very attractive program for the present convention. Dr. Blum called on representatives of the various branches where

In the Background Here Is a View of the Front Facade of Mount Vernon

chemistry classes had been held, requesting them to describe the nature of the courses and the manner in which they were conducted. O. J. Sizelove of the Newark Branch, A. K. Graham of Philadelphia Branch, H. W. Faint of Chicago Branch, W. Blum, Baltimore-Washington Branch, E. K. Stratton of the Providence-Attleboro Branch, L. C. Pan of the New York branch and C. L. Mantell of Pratt Institute described courses which varied from simple methods of instruction in the control of solutions by means of medicine droppers to very elaborate courses including lectures and laboratory work similar to college courses. Representatives of numerous other branches joined in the discussion, relating the difficulties under which they had labored in attempting to conduct classes in chemistry and telling of their plans for the coming year.

The intense interest of the majority of platers in the chemical control of their plating solutions was manifested by the large attendance, the enthusiastic comments and the final action of the body to instruct the secretary to bring before the business session of the convention a resolution to appoint a committee on education. The object of this committee was to draw up plans for a course which would be presented in all the branches which heretofore have had difficulty in organizing such activities, and to serve in a general advisory capacity to all the branches by furnishing such information or assistance as they may desire on the subject.

All those attending the session were furnished with a pamphlet by Hanson-Van Winkle-Munning Company of Matawan, N. J., entitled "Simple Methods of Analyzing Plating Solutions." This booklet consisted of a description of the so-called mechanical methods of analysis which have been so successfully used by the above company in the instruction of platers visiting the Research Laboratory at Matawan. Similar methods were very successfully employed by both the elementary and advanced classes conducted by Philadelphia Branch.

Sessions on Wednesday, July 2nd

At the educational session on Wednesday morning, Dr. E. B. Sanigar, research fellow of the American Electro Chemical Society of Columbia University, presented a paper entitled "Researches on Electroplating." Dr. Sanigar has published a number of papers dealing with the subject. His paper was a resumé of his previous researches and a preliminary report of his work just completed at Columbia University. The results of his researches are to be published in full in a paper of the American Electrochemical Society within the next year.

R. M. Wick of the Bureau of Standards presented a paper on "The Analysis of Silver Plating Solutions," and A. E. Thurber of the Oneida Community Company of Oneida, N. Y., then presented a paper on "The Commercial Control of Silver Plating" in which the importance of accurate control was especially emphasized. The discussion of all three papers on silver was most animated and interesting.

Dr. G. Soderburg of the Udylite Process Company then presented a paper on "Problems in Cadmium Plating," in which he stressed the value of cadmium as a material where contact resistance was to be eliminated as far as possible and emphasized the superiority of cadmium over copper for this purpose. The soldering of cadmium was also discussed and such factors as the adherence of the deposit, cleanliness of the surface, control of the temperature and the composition of the flux. Lacquering of cadmium with lacquer enamels was next covered and it was stated that marked improvement in finishes of this kind has been effected. In conclusion, the author suggested means of testing the corrosion of cadmium deposits and discussed the factors which lead to such corrosion.

W. P. Barrows, chemist of the Washington Navy Yard, presented a very interesting paper on "The Titration of Cyanide in Cadmium Baths," in which he recommended the titration of free cyanide with silver nitrate using potassium iodide as an indicator, the first turbidity representing the end point for free cyanide. By adding ammonia and continuing the titration further a second end point is obtained of a yellow turbidity which indicates the total cyanide. From these two titrations the total cyanide can be calculated with less than ten per cent error. An interesting fact seems to be the interference of iron with the accuracy of the titration and apparently the ammonium addition compensates for this error. Carbonates do not interfere if the caustic soda is approximately four ounces per gallon.

C. J. Wernlund of the Roessler & Hasslacher Chemical Company presented the next paper on "The Deposition of Zinc-Cadmium Alloys." Deposits of from 8 to 22 per per cent cadmium with the balance zinc cover the range of bright zinc cadmium alloys. They are obtained from a solution consisting of 10 ounces per gallon of zinc cyanide, 5 ounces per gallon of sodium cyanide, 12 ounces per gallon of caustic soda and ¼ ounce per gallon of cadmium oxide. The bath is operated at a temperature of 104° F., and anode current density of 6 to 10 amperes per sq. ft., a cathode current density of 20 to 40 amperes per sq. ft., and an EMF of 1 to 3 volts. The cathode current efficiency is close to 100% and the deposit possesses a hardness far in excess of either zinc or cadmium. Further experimental work is in progress to determine the practical application of this alloy, and from the interest manifested in the discussion such information will be greeted with enthusiasm.

On Wednesday afternoon a bus trip was taken to Arlington Cemetery where Thomas Slattery of the Baltimore-Washington Branch and the supreme officers of the Society had Master Richard Mesle, the son of one of the past presidents lay a wreath upon the tomb of the Unknown Soldier. The party proceeded to Mt. Vernon where the convention picture was taken and the historic grounds were inspected. They were joined at Mt. Vernon by a party of twelve who previously had flown over the historic spot and after returning to Washington had motored to Mt. Vernon in a private car.

Returning from the afternoon outing, hasty preparations for the banquet were made and at 7:30 sharp the doors of the Banquet Hall were opened. A most enjoyable menu had been selected and during the banquet the members and guests were entertained by the Baltimore-Washinotgn quartet and other talent.

Exhibits

A very remarkable exhibit of silver deposit was displayed by George B. Hogaboom. A. Tschantre of the Universal Electroplating Company exhibited chromium plated rolls for paper. Mr. Underwood of A. H. Wirz Inc., Chester, Pa., exhibited bright gold, nickel and copper plating on antimonial lead. W. S. Ermlich of the Baltimore-Washington branch exhibited copper sheets plated by the Baltimore Copper Company. A. C. Barth of the St. Louis branch gave an exhibit of door knockers in various plated and oxidized finishes and the Speakman Company, Wilmington, Del., gave an elaborate exhibit of chromium plated plumbing fixtures.

Prize Winners

J. M. Hay of the Chicago Branch received the first prize for the best paper presented during the year, entitled "Chromium Plating" and he also received the

Founders Gold Medal award of the American Electroplaters Society. C. F. Nixon received the second prize for his paper on "The Corrosion of Chromium Plate." W. W. Rowe of the Hartford, Conn., branch received the third prize for his paper on Chromium Plating. F. Romanoff and George B. Hogaboom received honorable mention.

The prize award for the best exhibit was given to A. R. MacFayden of the Arrow Electric Division, Hartford, Conn., who presented a detailed description of the manner of producing a great variety of lacquered and plated finishes on the numerous articles of electric equipment.

R. E. Pettit of the Aluminum Company of America received the second prize for a very elaborate display of plated, oxidized and colored lacquer finished on aluminum alloys which have been developed by the research laboratory at Buffalo.

The third award was given to B. M. Griffith, of the National Casket Company, for the beautiful silver finish and workmanship which marked his display.

GEORGE GEHLING
of the
Philadelphia Branch
President

R. J. O'CONNOR
of the
Bridgeport Branch
First Vice-President

New Officers of the American Electroplaters' Society

RAMON LOPEZ
of the
Rochester Branch
Second Vice-President

W. J. R. KENNEDY
of the
Hartford-Conn. Valley Branch
Editor, The Monthly Review

Membership Drive Successful

George B. Hogaboom, Chairman of the Membership Committee, reported the acquisition of 253 new members for the fiscal year, a net gain of 170 members, an increase of 18.25 per cent, and a total membership of 1,549. The Society is now at its peak.

New Officers

New officers were elected for 1930-1931 as follows:
President: George Gehling, Philadelphia.
1st Vice-President: R. J. O'Connor, Bridgeport.
2nd Vice-President: Ramon Lopez, Rochester.
Secretary-Treasurer: H. A. Gilbertson, Chicago.
Editor of The Monthly Review: W. J. R. Kennedy, Springfield. Mass.

1931 Convention in Rochester

The 19th Annual Convention, in 1931, will be held in Rochester, N. Y.

Ladies' Activities

On Monday, June 30th, the visiting ladies registered and were welcomed by the committees. During the afternoon they accompanied the men on the sight-seeing tour. In the evening there was a bridge party and 25 beautiful sterling silver prizes were given to those making the highest scores.

On Tuesday morning the ladies visited Washington's most important art galleries. In the afternoon they went with the men on the trip through the Navy Yard. A theatre party in the evening closed the day's festivities.

Wednesday morning was devoted to touring parks and visiting cathedrals. In the afternoon they joined the party going to Mt. Vernon. Wednesday evening was the occasion of the Annual Banquet.

The ladies went on a shopping tour on Thursday morning and accompanied the men on their visit to the Bureau of Standards during the afternoon. After this trip they said their farewells.

It was a gay and busy week.

Souvenirs

Udylite Process Company, Kokomo, Ind., furnished the delegates with a copy of the "Herald-Tribune" each morning. Roessler & Hasslacher Chemical Company, New York, distributed perpetual calendars.

A Surprise Visit

A. P. Munning, who recently retired from the Hanson-Van Winkle-Munning Company of Matawan, N. J., attended the Convention, even though he is no longer connected with the electroplating industry. He was warmly welcomed by his many friends.

Dr. E. B. Weston Elected New Honorary Member

There is a man who has done considerable pioneering work in the electroplating industry and who has not received any recognition from the American Electroplaters Society. This man came to the United States from England as a boy and obtained a position in a job plating shop in New York City. He endeavored to improve the quality of nickel plating and after considerable experiment found that by the addition of boric acid to a nickel solution the working of the solution itself was improved and the deposit given a whiter color.

He realized that there was no method of controlling the amount of metal that was being deposited. He studied Faraday's laws and knew that if the amount of current that passed through the bath could be determined, a definite amount of metal could be deposited. From this beginning he invented and brought out the well-known ammeter and voltmeter. Both of these instruments have become standard. There have been other instruments made but his instruments still retain the lead as far as accuracy is concerned.

He did one other thing of considerable value. In fact, if it were not for this invention electroplating would not have advanced as rapidly as it has. At the time of his work, the plating was done with wet batteries. He designed and supervised the construction of the first electroplating generator used in this country. This generator was exhibited at the Centennial Exposition in Philadelphia in 1876 and received a Gold Medal. Today this same generator is at the Ford Museum, Detroit, Michigan, at the request of Henry Ford, himself.

The American Electroplaters' Society has now recognized the ability of this man, Dr. Edward B. Weston, the inventor of the well known Weston electrical instruments and the generator, the principles of which are used in all generators of today. Dr. Weston has been elected an honorary member of the Society.

American Electroplaters' Society Incorporates

Acting upon a resolution passed by the Executive Board, which recommended the move, the American Electroplaters' Society has been incorporated under the laws of the State of New Jersey, as an association not for pecuniary profit. Incorporation was voted by the members present at the convention.

International Fellowship Club

The Annual Luncheon of the International Fellowship Club at the Mayflower Hotel on Tuesday, July 1, at 12 M., was a great success. Benjamin Popper, Chairman of the Club, presided and introduced the speakers, H. H. Steidle of the Department of Commerce, and Senator David I. Walsh of Massachusetts.

Senator Walsh spoke in a most interesting way on present-day business conditions. He stated that the depression had been brought about by the need for a readjustment period, which should normally have occurred in 1925 or 1926, but which held off for various reasons until this year.

Mr. Steidle described the work of the Government on developing and putting into use commercial standards.

Dr. W. Blum and Horace H. Smith were guests. A total of 50 were present at the luncheon.

The new officers elected for the coming year were as follows:

Chairman: John A. McCabe, Chas. F. L'Hommedieu & Sons Company, Chicago, Ill.

Vice-Chairman: Robert Leather, Lea Manufacturing Company, Waterbury, Conn.

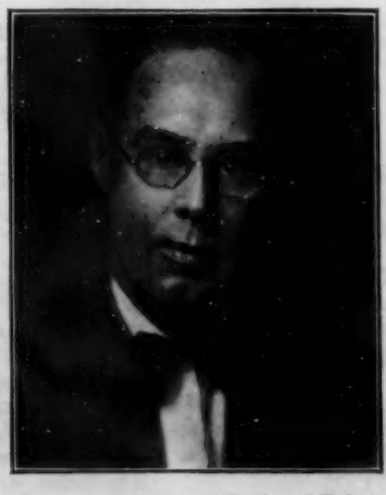
Secretary-Treasurer: Thomas A. Trumbour, THE METAL INDUSTRY, New York. Mr. Trumbour was designated as "permanent" in his post as a tribute to his conscientious and capable work.

The new officers were installed by the founder of the club, W. S. McKeon, Greensburg, W. Va.

Officers, International Fellowship Club

Harris and Ewing

JOHN A. McCABE
Charles F. L'Hommedieu and Sons Company
Chicago, Ill.
Chairman



Harris and Ewing

ROBERT LEATHER
Lea Manufacturing Company
Waterbury, Conn.
Vice-Chairman

T. A. TRUMBOUR
The Metal Industry and the Brass World, New York
Secretary-Treasurer

Variations in Thickness of Nickel Deposits

Experiment to Determine Different Thicknesses of Deposit in Different Parts of the Tank—Part II, Conclusion*

By LELAND E. GRANT and VERNON E. GRANT
Formerly Chief Chemist and Electroplating Foreman, Respectively, of the New Departure Manufacturing Company

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Table I on page 326 gives the results of measurements of 64 specimens. It will be observed that there is a very great variation in the thickness of the deposits. There is also apparent a general trend for the deposits to be thicker on the specimens at the bottom of the rack. The results reported for May 27, June 4, and June 23 should be examined especially in this connection. Those reported under each date were plated simultaneously.

These results might have been predicted when one considers that the anodes show the reverse of this, corroding more rapidly at the lower end or at times corroding more rapidly several inches from the end opposite the lower end of the cathode and causing the lower part of the anode eventually to fall off. The authors have not seen any explanation for either of these phenomena which is satisfactory to them. Analysis of samples of the solution taken during plating close to the anode near the surface of the solution and near the bottom of the anode did not show any difference in nickel concentration at the two levels. This indicates that there is not a very pronounced increase in conductivity of the solution near the bottom of the anode produced by settling of the more concentrated solution resulting from anode corrosion. Yet there must be a greater flow of current per unit of area at the bottom of the anode and at the bottom of the cathode to account for the results that are observed. The explanation for this should be determined because then it will probably become possible to find a way of preventing this uneven current distribution.

To emphasize the difference in the thickness of the deposit at the top of the racks and at the bottom, the specimens in the tables were grouped in two lots and the average thickness of plate for specimens from the top and from the bottom of the racks was computed. The ratio of bottom to top specimens was then determined and this is reported for each table. Although the difference between top and bottom specimens is not consistent nor uniform there is a general trend. The tables also show the variations in the thickness of deposits that can occur under apparently uniform conditions. To the authors this was a surprising and disturbing result. Based on fewer specimens it might rightly be questioned. But when the same results were obtained during two years of checking it became apparent that the lack of uniformity was real and had to be reckoned with.

The samples checked by weighing do not show so much difference between top and bottom specimens but it will be observed that there is considerable variation between specimens. Unfortunately it was not possible to complete these tests as was originally planned and make comparisons of both the weight and thickness. It was thought worth while, however, to include the table to show that differences were found as before, although not so great. There is some question in the minds of the authors as to whether or not there are significant variations in the density of nickel deposits. Possibly deposits uniform in weight would not be uniform in thickness.

The results obtained in a single nickel salt solution attain greater interest when compared with those from the old double salt solution. Table IV (page 327) gives the results of measurement made on specimens plated in a double salt solution of the following composition:

Double nickel salt	10 ozs / gal.
Ammonium Chloride	2 ozs / gal.
Boric Acid	2 ozs / gal.
Epsom salts (magnesium sulfate)	2 ozs / gal.

A lower current density had to be used but as meters were not available at that time the current cannot be given. As will be seen from the table the deposit on some of the specimens was rather thin. The per cent rejected because of being cut through to the brass in buffing was quite high at that time. When all the tanks had been changed to the single nickel salt type of solution the percentage rejected decreased very markedly. Credit for part of this decrease must be given to the closer control which was possible due to the installation of meters.

Comparing the average thickness of deposit (.00033 inches) in the single salt solution with that of .00019 inches in the double salt clearly shows the advantage of the single nickel salt solution. The 14% of the specimens in Table I with a deposit less than .00015 inches contrasted with the 50% in Table IV is also significant. The thicker deposit is not only helpful in eliminating rejects but of course gives so much more rust protection to the plated article.

Having found large and uncontrollable variations in the thickness of the nickel deposits it was decided that instead of trying to produce uniform deposits it would be better to produce as heavy a deposit as practical so that the various parts of the assembled coaster brake would have ample protection. Later the protection was still further increased by the substitution of copper instead of brass for the under-deposit. This will be discussed in another article.

The authors desire to acknowledge their indebtedness to L. F. Grant, chief metallographer of the New Departure Manufacturing Company for making the measurements of the thickness of the deposits and to Mr. Eugene Marchand of the engineering department for the sketches.

Conclusion

As a result of these experiments it appears that the following conclusions are justified.

1. Similar articles plated simultaneously in a single nickel salt solution do not have uniform deposits.

2. Pieces at the bottom of the rack usually have the thickest deposit.

*Part I appeared in the issue of June, 1930.

Table I

Single Nickel Salt Solution.
Cast Anodes 95-97% Nickel.
All specimens plated one hour.

For explanation of column headed "position of specimen" see Fig. 3, which appeared in Part 1 of this article, page 275, June, 1930.

Date	Tank	Temp.	Amps.	p H	Position of Specimen	Thickness of Deposit Inches
12-24-26	9	....	..	...	(unknown)	0.00015 0.00020
						0.00017 0.00023
12-31-26	8	72°F	..	6.0	(unknown)	0.00013 0.00008
1- 4-27	8	72°F	..	6.0	1	0.00028
					8	0.00026
2- 1-27	8	68°F	..	6.0	10	0.00016
					18	0.00014
2- 1-27	9	68°F	..	5.8	8	0.00016
					16	0.00014
3-31-27	5	72°F	..	5.6	1	0.00047
					2	0.00041
					3	0.00047
4-14-27	6	72°F	..	5.8	3	0.00009
	Double tank, specimens from one row of racks				11	0.00012
					16	0.00032
5- 3-27	6	74°F	90	5.6	7	0.00024
	Double tank. These specimens from one row of racks				8	0.00022
					9	0.00026
	These specimens from opposite row of racks				10	0.00020
					11	0.00014
5-17-27	11	74°F	75	5.4	1	0.00028
					3	0.00037
5-20-27	5	74°F	..	5.5	1	0.00059
					10	0.00039
5-20-27	11	74°F	..	5.4	1	0.00013
					7	0.00032
					16	0.00047

Date	Tank	Temp.	Amps.	p H	Position of Specimen	Small End	Large End
5-21-27	8	72°F	..	5.7	1	0.00020	0.00024
					10	0.00022	0.00028
					16	0.00017	0.00020
5-23-27	9	72°F	..	5.5	3	0.00013	
					18	0.00028	
5-27-27	11	74°F	80	5.8	1	0.00052	
					3	0.00076	
					4	0.00037	
					7	0.00048	
					10	0.00040	
					13	0.00015	
					16	0.00042	
					18	0.00062	
6- 4-27	11	76°F	70	5.7	1	0.00040	
					3	0.00046	
					7	0.00023	
					9	0.00045	
					10	0.00028	
					12	0.00056	
					13	0.00020	
					15	0.00053	
					16	0.00038	
					18	0.00037	

Date	Tank	Temp.	Amps.	p H	Position of Specimen	1st Run	2nd Run	3rd Run
6-23-27	11	78°F	70	5.7	7	0.00023	0.00041	0.00030
					9	0.00037	0.00067	0.00034
	Specimens in each run plated simultaneously.				10	0.00036	0.00039	0.00036
					12	0.00052	0.00068	0.00065

Average thickness of all specimens 0.00033 inches.

76% of specimens have a deposit 0.00020 inches or more.

14% of specimens have a deposit less than 0.00015 inches.

$$\frac{\text{Average thickness of bottom specimens}}{\text{Average thickness of top specimens}} = \frac{.00044}{.00032} = 1.37$$

Table II

Single Nickel Salt Solution.
Electrolytic Anodes 99 ± % Nickel
All specimens plated 1 hour.

Date	Tank	Temp.	Amps.	p H	Position of Specimen	Thickness of Deposit Inches
12-24-26	10	..	..	..	..	0.00026 0.00043
12-31-26	10	72°F	..	6.3	..	0.00012 0.00020
1- 4-27	7	72°F	..	6.3	11	0.00020
					16	0.00012
1-21-27	1	72°F	..	6.6	3	0.00028
					9	0.00028
1-21-27	3	72°F	55	6.4	12	0.00024
					18	0.00024
2- 1-27	10	68°F	..	6.1	2	0.00028
					9	0.00037
3- 1-27	3	..	72	5.6	1	0.00052
					7	0.00028
					10	0.00037
					16	0.00055
3-11-27	3	70°F	80	5.8	3	0.00057
					8	0.00035
					16	0.00032
3-19-27	3	72°F	68	5.6	16	0.00047
					17	0.00050
					18	0.00063
3-25-27	3	72°F	66	5.7	10	0.00028
					11	0.00028
					12	0.00056
4-28-27	11	72°F	60	5.9	3	0.00050
					7	0.00041
					17	0.00032
5- 2-27	2	74°F	75	6.1	7	0.00030
					8	0.00037
					9	0.00050
5-13-27	2	74°F	80	5.4	10	0.00030
					11	0.00031
					12	0.00043
5-20-27	2	74°F	70	5.9	1	0.00037
					7	0.00024
					16	0.00039
5-20-27	3	74°F	60	5.9	1	0.00024
					7	0.00027
					16	0.00018
5-20-27	4	74°F	66	5.9	1	0.00034
					4	0.00028
					7	0.00022
					10	0.00018
					13	0.00026
					16	0.00028
5-20-27	4	74°F	66	5.9	1	0.00018
					7	0.00032
					16	0.00016

Date	Tank	Temp.	Amps.	p H	Position of Specimen	Large End of Specimen	Small End
5-21-27	7	72°F	..	6.0	1	0.00013	0.00015
					7	0.00021	0.00021
					16	0.00010	0.00008
6- 4-27	2	..	80	..	1	0.00042	
					3	0.00065	
					4	0.00041	
					6	0.00063	
					7	0.00052	
					9	0.00068	
					10	0.00034	
					12	0.00061	
					13	0.00019	
					15	0.00024	
					16	0.00034	
					18	0.00060	

Average thickness of all specimens 0.00035 inches.

86% of specimens have a deposit of 0.00020 inches or more.

6% specimens have a deposit less than 0.00015 inches.

$$\frac{\text{Average thickness of bottom specimens}}{\text{Average thickness of top specimens}} = \frac{.00047}{.00030} = 1.56$$

See following page for Tables III and IV.

Table III

Single Nickel Salt Solution.
Cast Anodes 95-97% Nickel.
All specimens plated one hour.

Date	Tank	Temp.	Amps.	p H	Position of Specimen	Weight of Deposit grams.
12-22-27	1	..	79	..	16	0.4716
			..		17	0.4266
			..		18	0.5033
12-23-27	1	..	72	5.8	4	0.3035
					5	0.2065
					6	0.2394
					13	0.2394
					14	0.1684
					15	0.3388
12-29-27	1	70°F	66	5.9	4	0.2766
					5	0.2144
					6	0.2192
					13	0.2802
					14	0.2218
					15	0.2826
1-11-28	1	68°F	54	5.9	4	0.2302
					5	0.1964
					6	0.2334
					13	0.2500
					14	0.2628
					15	0.2457
1-11-28	1	70°F	60	5.9	4	0.1941
					5	0.1901
					6	0.2768
					13	0.2196
					14	0.2104
					15	0.2560
			Electrolytic Anodes			
12-29-27	3	70°F	70	6.0	4	0.2634
					5	0.2240
					6	0.2836

Average weight of deposit 0.2653 grams.

$$\frac{\text{Average weight of deposit on bottom samples}}{\text{Average weight of deposit on top samples}} = \frac{.2879}{.2760} = 1.04$$

Table IV

Double Nickel Salt Solution
Cast Anodes 95-97% Nickel
All specimens Plated one hour.

Date	Tank	Thickness of Deposit (inches)			
12-28-25	1	0.00012	0.00012	0.00016	
12-28-25	3	0.00012	0.00012	0.00012	
1- 8-26	5	0.00047	0.00035	0.00031	
1- 8-26	7	0.00043	0.00031	0.00031	
1-17-26	4	0.00008			
1-17-26	5	0.00025			
1-17-26	6	0.00008			
1-17-26	7	0.00008			
1-17-26	8	0.00012			
1-17-26	9	0.00012			
1-24-26	10	0.00015	0.00026		
1-24-26	11	0.00011	0.00012		
2- 6-26	8	0.00012	0.00014		
	9	0.00008	0.00011		
2-10-26	1	0.00020	0.00031	0.00016	0.00012
	2	0.00016	0.00016	0.00020	0.00031
2-17-26	5	0.00024	0.00043	0.00006	0.00008
	6	0.00010	0.00012	0.00012	0.00016
2-23-26	1	0.00021	0.00030		
	2	0.00027	0.00020		

Average thickness of all specimens 0.00019 inches.
40% of specimens have a deposit of 0.00020 inches or more.
50% of specimens have a deposit less than 0.00015 inches.

Plating on Carbon

Q.—We are interested at the moment in copper plating a very high resistance piece of carbon which will not permit electric current to pass through it at a low voltage such as used in our plating tank. If you have any information on any other method of plating of carbon which is used for resistance purposes, we would be greatly obliged if you would advise us.

After the copper plating is done, we want to be able to solder a copper wire to it.

A.—The only method of applying a copper coating to the carbon without electroplating, as far as we know, is by the use of the "Schoop" gun, which sprays molten metals. There is no copper immersion solution that will give an adhesive coating of copper.

If only a copper color were desired, a coating of copper could be applied by the use of a copper sulphate solution and iron filings, as follows:

Moisten the carbon with a solution made of 2 pounds of copper sulphate dissolved in 1 gallon of water. Then sprinkle the iron filings over the article and moisten again with the copper sulphate solution. This operation might have to be repeated several times before the whole surface is covered.

OLIVER J. SIZELOVE.

Tin Plating

Q.—I am using a tin solution made up as follows:

Sodium stannate ..... 24 oz.
Tin chloride ..... ¼ oz.
Rosin (per gallon) ..... 3/100 oz.
Anodes, tin.

I find that this solution does not work satisfactorily. If I use more than ½ volt, the tin forms on the work in loose particles, like frost. The deposit is dark when solution is operated at 4 or 5 volts. I would like to get a heavy deposit of tin. How can I improve the solution?

A.—While we do not recommend the formula you are using, we believe that if you will add 2 ounces of caustic soda to each gallon of solution better results will be had. After you have made the addition of caustic soda, if results are not satisfactory we would suggest that you make a solution as outlined in PLATER'S GUIDEBOOK, page 11.

OLIVER J. SIZELOVE.

Cloudy Nickel

Q.—We are sending you a sample of our nickel solution for analysis. Work comes out all right if solution is operated for strong current and a white deposit is wanted. If a bright finish is desired, work comes out scummy and black; when buffed, it is all cloudy.

A.—Analysis of nickel solution:

Metallic nickel ..... 2.79 oz.
Chlorides ..... 1.49 oz.
pH 5.6

Analysis shows the solution to be low in chlorides and the deficiency in this chemical is doubtlessly causing the poor throwing power of the solution.

We suggest that you add one and one-half ounces of ammonium chloride to each gallon of solution. If this does not overcome your trouble, secure some old pieces of work or some old plating racks, suspend them on cathode rod, and operate solution at the highest current density possible for four or five hours.

OLIVER J. SIZELOVE.

Testing Materials Society Meeting

A Report of the Thirty-Third Annual Meeting in Atlantic City, June 23-27, 1930

THE American Society for Testing Materials held its annual meeting at the Chalfonte-Haddon Hall, Atlantic City, N. J., June 23-27, 1930.

NEW OFFICERS

The officers elected for 1930-31 are as follows:

President:

K. G. MACKENZIE, Consulting Chemist, The Texas Company, New York City.

Vice-President:

CLOYD M. CHAPMAN, Consulting Engineer, New York City.

Members of Executive Committee:

F. H. JACKSON, Senior Engineer of Tests, U. S. Bureau of Public Roads, Washington, D. C.

ZAY JEFFRIES, Consulting Metallurgist, Aluminum Company of America, Cleveland, Ohio.

H. H. QUIMBY, Consulting Bridge Engineer, Philadelphia, Pa.

G. A. REINHARDT, Director of Metallurgy and Research, Youngstown Sheet and Tube Company, Youngstown, Ohio.

H. N. VAN DEUSEN, Materials Engineer, Bell Telephone Laboratories, New York City.

Charles B. Dudley Medal Award

The Charles B. Dudley Medal was awarded to J. R. Townsend, W. A. Straw and C. H. Davis, joint authors of the paper entitled, "Physical Properties and Methods of Test for Some Sheet Non-Ferrous Metals," presented at the annual meeting of the Society in 1929. (For an abstract of this paper see The Metal Industry, July, 1929, page 323.)

J. R. TOWNSEND, Metallurgist, Bell Telephone Laboratories

Mr. Townsend is connected with the General Development Laboratory of the Bell Telephone Laboratories, Inc. He has been largely concerned with the development of testing methods for metals and the engineering of metallic materials. He is the author of the following papers: "Fatigue of Telephone Cable Sheath Alloys," presented before the Society in 1927; "Fatigue Studies of Non-Ferrous Sheet Metal," with C. H. Greenall, in 1929; and "Telephone Apparatus Springs," presented before the American Society of Mechanical Engineers in 1929.

Mr. Straw, Development Engineer of the Western Electric Company, Inc., graduated at Wheaton College and continued his studies in chemistry at the

W. A. STRAW, Development Engineer, Western Electric Company

University of Illinois during 1913-1914. Since 1918 he has been connected with the Western Electric Co., Inc., during the past three years being in charge of raw material development and control.

Mr. Davis, Assistant Metallurgist of the American Brass Company, is a graduate of Yale University, class of 1909, receiving subsequently the degree of M.A. in Geology from Leland Standford, Jr. University (1912). He has been engaged in metallurgical

C. H. DAVIS, Assistant Metallurgist, American Brass Company

work in the laboratory of the American Brass Company since 1912, having had charge of the chemical and metallographical laboratory since 1919. He has been author or joint author of a number of papers dealing with various studies on non-ferrous metals, among them being a paper on "Physical Properties and Methods of Test for Sheet Brass," presented before the Society in 1927, when he was joint author with H. N. Van Deusen and L. I. Shaw.

Abstracts of Papers and Reports on Non-Ferrous Metals

Report of Research Committee: On Fatigue of Metals. H. F. Moore, Chairman.

A comprehensive review of the present knowledge of fatigue of metals.

Fatigue Studies of Telephone Cable Sheath Alloys. J. R. Townsend and C. H. Greenall.

A presentation of the endurance limit characteristics of pure lead, lead tin, lead antimony, and lead calcium cable sheath alloys showing results not only for the flat cantilever type test specimen but also for the rotating beam type of specimen of a new and simplified design. Also a discussion of the possibility of short-time fatigue tests.

The Influence of Stress and Cycle Frequency on Corrosion. D. J. McAdam, Jr.

A discussion of the effect of stress and cycle frequency on the rate of damage of ordinary steels, corrosion-resistant steels, monel metal and aluminum alloys, under corrosion. Diagrams were presented showing the relationship between stress and corrosion rate, and between cycle frequency and corrosion rate and three-dimensional diagrams showing relationship between stress, cycle frequency and rate of net damage.

Report of Committee B-3: On Corrosion of Non-Ferrous Metals and Alloys. T. S. Fuller, Chairman.

The committee reported completion of erection of materials on test racks for atmospheric corrosion studies; progress on corrosion in liquids and on galvanic and electrolytic corrosion.

Report of Committee D-14: On Screen Wire Cloth. R. W. Woodward, Chairman.

The results of atmospheric exposure and laboratory tests of non-ferrous screen wire cloth, and also a detailed study of the sulfur dioxide content in the air at the various exposure stations.

A Critical Study of the Error of Averages and Its Application to the Field of Corrosion Tests. C. H. Humes, R. F. Passano and Anson Hayes.

A simple laboratory method is given for determining the number of samples required to produce a given accuracy for systems the distribution characteristics of which have been determined, but which do not lend themselves readily to treatment by the principles and laws of normal probability.

Report of Sectional Committee: On Specifications for Zinc Coating of Iron and Steel. J. A. Capp, Chairman.

Some Observations on the Outdoor Atmospheric Corrosion of Zinc Protective Coatings of the Galvanized Type. C. L. Hippensteel, C. W. Borgmann and F. F. Farnsworth.

A description of the results of an investigation made for the purpose of setting up requirements which an accelerated corrosion test must meet. The authors presented results of three separate studies of the rates of corrosion under different exposure conditions and described the laboratory accelerated test (rotating alternate immersion test) and an outdoor accelerated test, in which normal outdoor weathering conditions are used except that simulated additional rainfall is obtained by means of a water spray, used on the galvanized coatings.

Report of Committee B-1: On Copper Wire. J. A. Capp, Chairman.

New specifications for grooved trolley wire for mine service developed in cooperation with the A.E.R.A., the N.E.M.A. and the American Mining Congress.

Report of Committee B-2: On Non-Ferrous Metals and Alloys. William Campbell, Chairman.

Data are given on tests of 12 aluminum-base and 9 zinc-base die casting alloys covering the range of commercial compositions and involving physical and chemical studies of about 50,000 specimens; also reports on preparation of specifications for die-casting alloys and on abrasion tests of bearing metals. New methods of chemical analysis of silver solders were presented for publication as tentative.

Development of Zinc-Base Die-Casting Alloys. D. L. Colwell.

A summary of the development of die-casting alloys, including the early zinc die-castings containing tin, the introduction of aluminum-containing alloys, the use of high-grade zinc, the introduction of magnesium and further improvement in purity of zinc, treating the subject from an engineering rather than from a metallurgical standpoint.

Silver Solders. R. H. Leach.

A discussion of the properties of alloys commonly called silver solders, characteristics of different compositions including melting range, ductility, strength, corrosion resistance, and electrical conductivity. Different fluxes and their proper use were explained.

Report of Committee B-4: On Electrical-Heating, Electrical-Resistance and Electric-Furnace Alloys. Dean Harvey, Chairman.

A test program was outlined comparing life of electrical heater wires in accelerated life test with that under service conditions, effect of atmospheric humidity upon life, test procedure for temperature coefficient to resistance, bend test for determining elastic properties of alloys at high temperatures. Specifications for electrical heating wires are in preparation and a study on alloys for electric furnace structures and test methods therefor. A new method of test for thermo-electric power was presented and adoption as standard recommended of the tentative method for change of resistance with temperature of metallic materials for electrical heating.

Report of Committee B-7: On Light Metals and Alloys, Cast and Wrought. J. B. Johnson, Chairman.

Progress of a study of aluminum-base casting alloys and decision to consider revision of existing specifications for aluminum-base alloy sand castings and for aluminum-base sand-casting alloys in ingot form; specifications for magnesium-base alloy castings.

Report of Committee B-5: On Copper and Copper Alloys, Cast and Wrought. C. H. Mathewson, Chairman.

This committee recommended the advancement to standard of the tentative specifications for seamless copper tubes. They presented revisions in tentative specifications for copper tubing for refrigerators and tentative revisions of standard specifications for seamless admiralty condenser tubes, for seamless 70-30 brass condenser tubes, and for seamless muntz metal condenser tubes.

Report of Special Committee: On Promotion of General Use of Specifications for Copper Alloys in Ingot Form. G. H. Clamer, Chairman.

Progress of survey of specifications for copper alloys in ingot form looking toward simplification of practice as to number of specifications in use; also an investigation of copper-base ingot metals for purpose of deciding on optimum number of compositions of ingot metal and the development of standard specifications.

The Effect of Small Additions of Nickel to a Bearing Bronze. Clair Upthegrove.

The results of a study of the effects on micro-structure and hardness of 85 per cent copper-15 per cent tin bearing bronze, of additions of 0.12, 0.25, 0.50, 1.0, 2.0, 3.0, 5.0 and 10 per cent of nickel. Measures of the hardness of the alpha and delta constituents using the Bierbaum Micro character and an apparent relationship between hardness of the above micro constituents and the nickel addition.

Th Significance of Hardness Values for Some Copper-Zinc Alloys. C. H. Davis and E. L. Munson.

The effect of grain size on the hardness of both annealed and cold-worked alpha phase copper-zinc alloys has been observed. The significance of variables which affect hardness values is shown by a series of curves.

Hardness values indicate:

1. The grain size of any given annealed alloy.
2. The grain size of any given cold-worked metal if used in conjunction with the percentage of reduction.
3. The percentage of reduction of any given alloy when used with the grain size.

Hardness values for a given grain size change progressively from that of pure copper to that of the alpha alloy of lowest copper content.

The hardness value maximum near the center of the alpha range, which has been recorded by several investigators, is not observed if any given grain size is taken as a basis for the hardness-chemical composition relationship. It is evident that this reported maximum is a function of the annealing temperature and the amount of previous cold working.

SYMPOSIUM ON AIRCRAFT MATERIALS

The papers listed were brief summaries of the present knowledge on the properties or on the testing of aircraft materials.

Structural and Engineering Light Alloys for Aircraft. R. L. Templin, F. V. Hartman and E. C. Hartmann.

Corrosion-Prevention Methods as Applied to Aircraft Construction. H. S. Rawdon.

Notes on Aircraft Finishes. H. A. Gardner.

Applications of Stampings, Forgings and Castings. H. G. Runde.

Materials of Construction in Aircraft Engines. R. R. Moore.

Failures in Aircraft Engine Parts and Causes Thereof. T. T. Neill.

Development of Specifications and Materials Control. H. A. Backus.

Mechanical Testing of Aircraft Materials. J. B. Johnson.

Joining Aircraft Materials, Welding, Brazing, Etc. T. W. Downes.

Procedure Control in Aircraft Welding. H. L. Whittemore.

X-ray Testing of Aircraft Materials. Ancel St. John.

Photo-Elastic Studies of Aircraft Parts. T. H. Frost.

Heat Treatment, Process Control, and Results Ferrous and Non-Ferrous. H. C. Knerr.

Casting Alloys

Q.—A manufacturer of statuettes has asked us to give him certain information pertaining to alloys which he desires to use for his product. We are wondering if you can give us some information in answer to the following:

(1) What are the alloys of metals suitable for casting in Ciré-Perdue molds—alloys of copper, tin, lead and zinc?

(2) Is it possible to make an alloy melting at less than 1000° F. and having a strength, color and fineness superior to ordinary white metals? Toughness and ductility are required rather than hardness and brittleness. It should be fairly cheap, not having too large a proportion of tin or bismuth and having as large a proportion of copper as is consistent with melting in an iron ladle instead of a crucible. Are there alloys of this sort on the market?

(3) What are the alloys of white metals suitable for casting in brass molds, or if practical, molds of refractory fire cement?

A.—The Ciré-Perdue method of casting is the same as the old Lost Wax process.

1. The wax composition generally used is composed of beeswax, two parts, and rosin, one part, and should be put on the object from ¼ to ½ inch thickness.

2. The mixture of sand used to fill in the space between the impression and the flask is French sand and Albany mixed. Do not ram the sand too hard.

3. The melting out process: The wax is generally melted out in the core oven.

4. Alloys are of the red brass group. One that gives very nice results is made up of 88% copper, 7% tin, 4% zinc, 1% lead; or 88% copper, 3% tin, 4% zinc, 5% lead.—W. J. Reardon.

So far as we know there is no alloy melting at less than 1000° F., with properties superior to Britannia metal or some one of the other white metals consisting principally of tin, hardened with antimony or copper. If a little higher melting point is not too serious an objection, an alloy containing 85% aluminum, 5% copper, 10% tin, makes strong castings of considerable ductility and capable of taking a beautiful polish.

The best white metal for casting in brass molds is Britannia metal. This term covers quite a variety of compositions, of which one of the best is 90% tin, 8% antimony, 2% copper. Others are lead 85, antimony 15; zinc 95, aluminum 5.—H. M. St. John.

Deep-Etch Test of Brass

A Rapid and Simple Method of Testing Brass Castings for Soundness—Part 2, Conclusion*

By W. F. GRAHAM and L. A. MEISSE
Technical Division, The Ohio Brass Company, Mansfield, Ohio

FROM A PAPER READ AT THE CLEVELAND MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, MAY 12-16, 1930.

EXAMPLES OF DEEP-ETCH SPECIMENS

Fig. 1A illustrates a specimen that is considered a very good red brass. The section was taken from composition ingot containing copper 80.62 per cent, tin 3.33, lead 6.93, zinc 8.82, iron 0.13, antimony, 0.17, manganese nil and phosphorus nil. It will be observed that the only differential attack visible is on the grain boundaries of the crystals, with the exception of a slight trace in the portion which might be termed pipe.

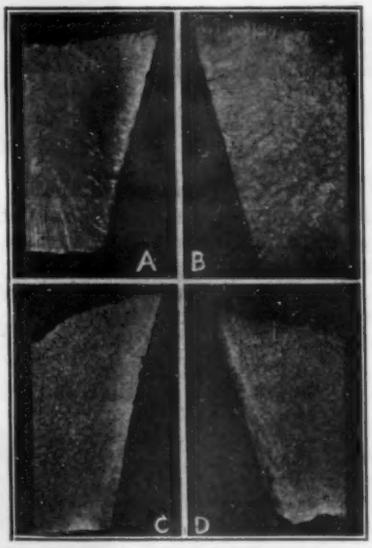


Fig. 1—Deep Etched Sections from Red-Brass Composition Ingot, Showing Attack on Grain Boundaries of Crystals, and Trace in "Pipe" Portion. Analysis:

A—Cu 80.62; Sn 3.33; Pb 6.93; Zn 8.82; Fe 0.13; Sb 0.17.

B—Cu 85.93 Sn 2:77; Pb 3.39; Zn 6.74; Fe 0.10; Sb 0.07.

C—Cu 79.2; Sn 3.7; Pb 7.01; Zn 9.83; Fe 0.10; Sb 0.16.

D—Cu 83.74; Sn 5.20; Pb 5.04; Zn 5.85; Fe 0.13; Sb 0.04.

Fig. 1B shows material of the same sort having an analysis of copper 86.93 per cent, tin 2.77, lead 3.39, zinc 6.74, iron 0.10, antimony 0.07, manganese nil and phosphorus nil. The indications are that this lot of ingots is not as free from inclusions as that shown by Fig. 1A. It is our feeling that it contains a considerable amount of oxide, presumably in the form of zinc oxides.

Fig. 1C represents an etched section which is of poor appearance. This ingot contained copper 79.2 per cent, tin 3.7, lead 7.01, zinc 9.83, iron 0.10 and antimony 0.16. The center portion obviously contains more inclusions than the areas adjacent to the edges.

Fig. 1D is of composition ingot having analysis of copper 83.74 per cent, tin 5.20, lead 5.04, zinc 5.85, iron 0.13, and antimony 0.04, in which we have an etching attack of the whole surface. In this case it would seem that the condition is caused by an overreduction of the metal in the refining process. There are apparently impurities or compounds forced out to the grain boundaries, thereby promoting the differential attack of the reagent.

The four specimens of Fig. 1 represent metals alloyed and cast with a minimum of influencing factors other than the furnace conditions during the melting and refining of the metal. The deep-etch method of test, however, when applied to metals or alloys subjected to further influences such as casting into molded shapes, reveals other conditions in the structure.

Aside from impurities or other influencing factors resulting from the melting—the casting of the alloy into irregular shapes, running the metal over the sand, the rate of pouring the casting and the temperature at which the metal is poured—may at times bring about effects in the resulting solid metal which can be shown by a deep etch of a section taken from the casting.

Porosity and Fissures

The deep-etching test will not only reveal inclusions in the casting and character of the metal from an oxidized or reduced standpoint, but also porosity, laminations or actual fissures which are not visible to the eye in the unattacked fracture.

Fig. 2A illustrates blow-holes and other unsoundness in the boss of a casting from an alloy of the approximate composition of 84 per cent copper, 3 per cent tin, 3 per cent lead and 10 per cent zinc.

We have found a considerable number of inclusions in red brass of the composition 81.5 per cent copper, 3 per cent tin, 7 per cent lead and 8.5 per cent zinc melted in an open-fire type of furnace, as illustrated by Fig. 2B, showing the section of the hexagon portion of a valve body.

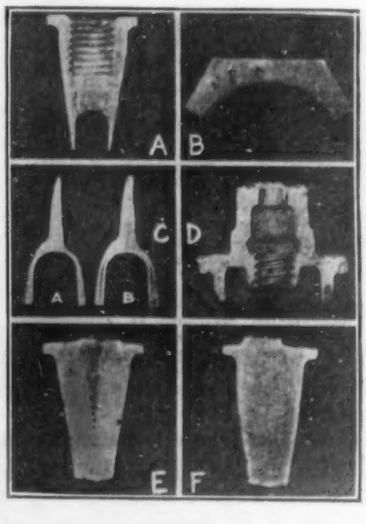


Fig. 2—Sections of Red-Brass Castings, Deep Etched to Bring Out Defections More Clearly

A—Blow-Holes and Other Unsoundness in Boss. Approximate Analysis: Cu 84; Sn 3; Pb 3; Zn 10.

B—Inclusions in Hexagon Portion of Red-Brass Valve Body, Melted in Open-Fire Furnace. Approximate analysis: Cu 81.5; Sn 3; Pb 7; Zn 8.5.

C—Effect of Very Hot Pouring on Light-Section Castings. "A" Is Sound Casting; "B" Is Defective, Showing Attack at Juncture of Columnar Crystals. Approximate Analysis: Cu 87.75; Sn 5.5; Pb 1.75; Zn 5.

D—Iron Inclusion Revealed, Causing Machining Difficulties. Analysis Same as for B.

E—Shrink in Boss of Trolley Ear, Not Otherwise Visible than by Deep Etching.

F—Same Casting as E, but Showing Porous Condition Through Entire Section.

Effect of Hot Pouring

The effect of very hot pouring on light-section castings made from composition of copper 87.75 per cent, tin 5.50, lead 1.75 and zinc 5.00 may be seen in Fig. 2C. Specimen *A* of Fig. 2C is a sound casting and Specimen *B* is a defective casting, which the deep etching reveals by attacking the juncture of the columnar crystals.

Contamination of red brass by iron promotes serious difficulty in the machining operation. Fig. 2D illustrates a section of a casting of the same composition as that in

*Part I appeared in the issue of June, 1930.

Fig. 2B, in which there are considerable iron inclusions revealed by deep etching.

The actual character of metal is not wholly revealed by fracture nor by examination of the machined surface. Fig. 2E shows the shrink in the boss of a trolley ear which was not otherwise visible, and Fig. 2F shows a porous condition through the whole section; both of these conditions are revealed by deep etching. Figs. 3A and 3B reveal shrinkage and porosity in sections of a trolley-wheel casting of approximately copper 94.7 per cent, tin 5.00 and phosphorus 0.3 per cent.

Considerable difficulty was experienced at one time in properly casting an alloy of composition of copper 94 per cent, tin 2 per cent, lead 3 per cent and zinc 1 per cent. Fig. 3C illustrates a gassy condition of a section cut from the casting, while Fig. 3D is that of a good casting. In both specimens considerable difficulty would have been experienced in differentiating between the unsatisfactory and satisfactory metal. The deep etching reveals the nature of the trouble immediately.

Determining Causes of Defects

The application of the deep-etching test as a means of determining the exact cause of certain foundry difficulties is well illustrated in Fig. 3E. The deep-etched section of the casting as shown by Specimen *A*, Fig. 3E, indicates sound metal, but until the deep-etch test was performed, considerable doubt as to the character of the metal was generated by examination of the rough surface, as shown in Specimen B, which is the other half of the same casting. The defective casting obviously was the result of conditions other than those pertaining to the quality of the metal.

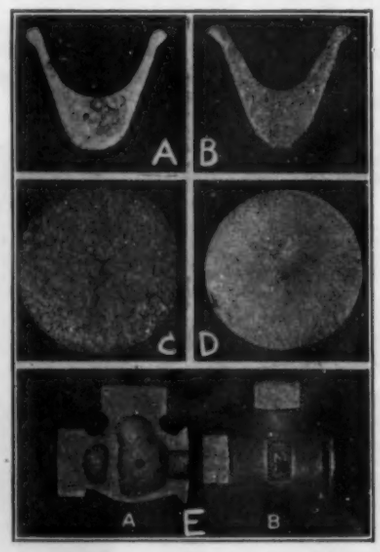


Fig. 3 — Application of Deep Etching to Reveal Specific Defects in Red-Brass Castings

A and B—Shrinkage and Porosity in Sections of Trolley-Wheel Casting. Approximate Analysis: Cu 94.7; Sn 5; Ph 0.3.

C and D—Deep Etching to Differentiate Between Satisfactory and Unsatisfactory Metal. "C" Shows Gassy Condition of Section; "D" Shows Good Section from Same Casting. Approximate Analysis: Cu 94; Sn 2; Pb 3; Zn 1.

E.—Determining Exact Cause of Foundry Difficulties. Examination of Rough Surface of Casting, as in "B," Created Doubt as to Character of Metal. "A" Showed Sound Metal, Revealed by Deep Etching, Proving That Defect Was Caused by Conditions Other Than Quality of Metal.

Application to Aluminum-Bronze and Yellow Brasses

The application of the deep-etch test to other alloys than red brass is shown by Fig. 4A, which illustrates the section of an aluminum-bronze glider casting. This particular alloy and casting are remarkably sound and clean in the section shown.

An illustration of rather clean metal in a valve casting, similar in composition to that shown in Fig. 2B, is shown in Fig. 4B. Sound, clean yellow brass seems to deep etch with about the same results as sound, clean red brass. An example of this is shown in Fig. 4C, which illustrates a section cut from a yellow-brass composition ingot.

The effects of faulty gating, which did not properly feed a rather difficult casting to make, is shown by the deep-etched section illustrated in Fig. 4D. The fracture did not reveal the areas of porosity uncovered by the deep-etched attack.

Dirty Metal

Specimen *A* in Fig. 5A illustrates a casting taken from a very "dirty" heat rejected on the floor of the foundry.

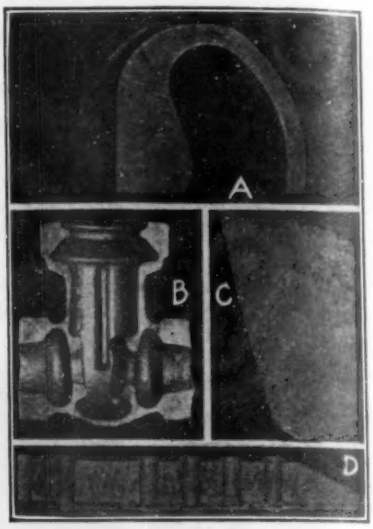


Fig. 4—Miscellaneous Applications of Deep Etching

A—Aluminum-Bronze Glider Casting, Showing Very Sound and Clean Metal.

B—Clean Metal Revealed in Valve Casting; Composition of Metal Similar to That Shown in Fig. 2B.

C—Deep Etching of Sound and Clean Yellow Brass Apparently Gives Same Results as With Red Brass. Section of Yellow Brass Composition Ingot.

D—Effects of Faulty Gating in Difficult Casting Fed Improperly. Fracture Failed to Disclose Porosity Which Deep Etching Uncovered.

The cause of this condition is not fully uncovered, although it may have been brought about by an oxidizing condition in an open-flame furnace, combined with a certain amount of impurities in the original charge.

The "dirty" condition of the surface of the casting went hand-in-hand with the dirty condition of the interior of the metal as shown by the deep-etch sections of Specimens *B* and *C* in the same illustration. The sound structure of the section of yellow-brass ingot shown in Fig. 4C

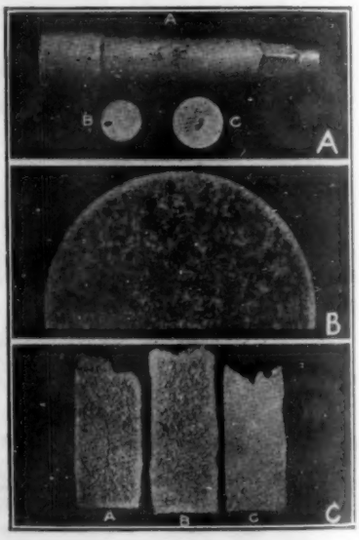


Fig. 5 — Oxidation in Brass Castings, and Improper Foundry Conditions as Revealed by Deep Etching

A—Casting from a "Dirty" Heat Rejected on Foundry Floor; Probably Caused by Oxidizing Conditions in Open-Flame Furnace and Impurities in Charge. "A" Shows Dirty Surface Condition; "B" and "C" Show Same Condition in Interior of Metal.

B—Heavily Oxidized Condition Uncovered in Yellow-Brass Casting from Experimental Heat. Compare With Sound Structure of Section in Fig. 4C.

C—Three Conditions of Red Brass Caused by Furnace Conditions in Melting Under Reducing, Oxidizing and "Neutral" Atmosphere. "A" Shows Fissures in Interior, Uncovered by Deep Etching Reduced Condition; "B" Shows Presence of Oxidation; "C" Reveals Uniform Structure Typical of Sound Red Brass.

may be compared with the remarkably unsound condition of the structure of an experimental yellow-brass heat illustrated in Fig. 5B. The deep etch of this section reveals a remarkably oxidized condition of the metal.

Three conditions of red brass as brought about by the melting conditions are illustrated in Fig. 5C. The three specimens, *A*, *B* and *C*, of Fig. 5C show deep-etching sections of castings from experimental heats melted under reducing, oxidizing and so-called neutral atmosphere. In Specimen *A* the fissures in the center of the casting are revealed by the deep etch of the so-called reduced condi-

tion. In Specimen *B* deep etching shows the presence of oxidation, while in Specimen *C* there is a uniform structure typical of sound red brass.

CONCLUSIONS

It has not been our intention in this paper to discuss at any great length the application of this test as a means of control by the foundryman of the quality of material that he may purchase or produce. We do desire, however, to record the fact that our application of this test as applied to composition ingot has resulted, we believe, in a benefit in respect to the quality of the material.

A number of the refiners of secondary composition ingot are now making some use of this method as a control of their furnace operations, and our routine deep-etch tests of incoming shipments of ingot within the last year have indicated that there is a general improvement in the quality of the red-brass alloy with respect to oxides and other inclusions.

With respect to the results obtained by the test in the foundry, it is obvious that the porosity in castings can be determined quickly by the etching of sections. In standardization of melting practice, tying back to the character of the raw materials used as melting base, the deep-etch test is not only of interest but of positive value.

Unfortunately, red brasses are not sound materials in general, when examined from edge to edge; but, very fortunately, there is a sound skin at least on the edges of the casting section. If it were not for this latter condition, the foundryman would have a great deal of difficulty in producing a casting which would meet pressure test.

In order to overcome some of the extreme conditions which may cause trouble due to the porosity of the interior of the metal, it will be found that the application of the deep-etch test will provide a means for the foundryman to survey this condition and make the necessary corrections in his melting and molding practice.

Flux Spots and Tin Oxide Blots

BY WALLACE G. IMHOFF
Consulting Metallurgist, Vineland, N. J.

FLUX spots on retinned milk and ice cream cans are caused by failure to thoroughly clean the cans, and also to flux which is dirty and contains foreign matter. After burning all the fat and grease substance off the can, instead of dipping, or soaking in a hot bath containing soda, clean in a good hot bath of a good metal cleaner.

The metal cleaning solution is made up in a steel tank of a size suitable for the work, and the solution is kept right at the boiling point. The heating coils should be of the closed type so that the condensed steam will not dilute and destroy the strength of the cleaning solution, and they should be hung on the sides of the tank so as to be entirely clear of the grease, muck, and dirt, which drops off the articles cleaned. A temperature between 180° and 200° F. should be maintained all the time for the cleaning solution, and the nearer it is kept to 200° F. the better will be the results.

From the boiling hot cleaning solution the cans should be washed in clean boiling hot water. A very important feature to observe is that the tank capacity is large for both the cleaning solution and the boiling hot water rinse, since the solutions become very foul and bad when the volume of liquids is too small in relation to the production, and grease and dirt to be removed.

After rinsing in clean, hot, boiling water, dip, or pickle in the usual muriatic acid pickle. Be sure that they are well rinsed before dipping into the acid pickle so that all the cleaning solution has been entirely removed.

Tin oxide blots suggest that the flux is not in good condition, so that to determine this fact, it is suggested that a change be made in fluxing solutions. It is suggested that you use a good liquid tinning flux. This flux must be clean, pure zinc chloride especially made for the purpose of tinning.

The tin bath should be well boiled out before starting operations to bring all the oxides, scruf, and dirt in the metal to the surface. After this has been done, put on a small amount of liquid flux on the bath, and wash back and forth over the entire surface of the bath to take up all the tin oxide, scruf, and dirt boiled out of the tin bath. When this has been done, skim this flux off the bath clean, and throw it away. Then put a clean flux on the bath.

After the cans are removed from the muriatic acid pickle, dip in a clean solution of the liquid tinning flux, and then dip into the tin bath. Good Straits tin should be used for the metal, and the temperature should be controlled by an electric indicating or recording pyrometer. Guessing the metal temperature should not be tolerated. The temperature should also be kept as low as possible in relation to the size of the article, and the production required.

The tin pot should also be kept well cleaned of tin-dross, since iron in the tin promotes oxidation of the tin much faster than when the tin is pure. Flux spots and tin oxide blots are seldom encountered if the solutions are clean, the capacity sufficient, and the metal in the tin pot is kept clean, and the temperature of the bath controlled with an electric pyrometer.

Plating Inside of Tube

Q.—How are stay bolts for boiler work copper plated on the inside? They are made of steel, about 30 inches long, with 3/16-inch hole. I don't want the outside plated. Would like to avoid use of stop-off varnish as it takes too much time.

A.—To copper plate the inside of a tube 30 inches long with 3/16-inch hole, it will be necessary to use an inside anode. If you do not wish to use a stop off to prevent the copper from depositing on the outside of tube, it will be necessary to seal one end and place tube in a vertical position and place solution inside of the tube for plating.

Naturally, the volume of the solution will be small and the metal in the solution will be easily depleted, so that it may be necessary to change the solution during the plating operation. This depends upon the amount of copper that you are compelled to deposit on the inside of the tube. OLIVER J. SIZELOVE.

Application of Brass Ingot Metal in Industry

The Advantages of Ingot Metal Over Virgin Metals in the Foundry

By WILLIAM ROMANOFF and C. O. THIEME
Technical Superintendent and Metallurgist, Respectively, H. Kramer and Company, Chicago, Ill.

FROM A PAPER READ AT THE CLEVELAND MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, MAY 12-16, 1930.

THE ingot brass industry has made rapid strides during the past ten years in the development of processes and improvement of the quality and uniformity of the product. This, to a large degree, has overcome the "conscientious objection" to the use of its products.

The smelter and refiner began to realize that, to survive, they must consistently make a product which would satisfactorily compete with virgin metals. Years ago ingot manufacturers did not enjoy a healthy reputation, but we believe this was due to metallurgical ignorance of those in the ingot business rather than to any malicious attempt to misrepresent their product or to make ingot not uniform or properly refined.

Through all this it was realized also that in order to make a good product technical control must be established. Imaginative secretiveness is disappearing rapidly among the brass ingot manufacturers and now, after years of diligent effort and research, tremendous improvement is noted.

Application

It is a known fact that the most vital factor in the manufacture of good castings is that of foundry practice. Improper gating of castings can cause a shrinkage condition, dirty castings misruns, etc. The wrong pouring temperature will cause the castings either to misrun or to be porous throughout as well as rough on the surface. Shifted castings are usually due to defective pattern equipment. Poor sand conditions will create surface porousness or roughness and other ailments.

So much has already been written on furnaces and melting atmospheres—and, so that we may continue a treatise on the ill or good effects of foundry practice indefinitely—we will eliminate these factors entirely from our discussion.

After foundry practice, the question of metal arises, and under this heading the application of brass ingot metal. By ingot we mean a cake or block of alloyed brass or bronze that has been obtained from the refinement of secondary metals as a base. This refinement, in general, is as follows:

Secondary metals are sorted into various classifications and then melted in large quantities, usually in the open-hearth type of furnace, although other types of furnaces find application with some types of alloys. After melting, air is introduced, which either eliminates the easily oxidizable impurities — such as silicon, manganese, aluminum, phosphorus, iron, etc.—or reduces them to percentages not objectionable nor detrimental.

After these impurities are slagged off the top of the bath, the molten metal is then poled with green saplings to reduce the oxides of the main constituents formed by the introduction of air. During this entire process, chemical analyses are made and test plugs are examined. The metal is then built up to specification and poured into ingot.

We have found from experience, observation and test that any brass and bronze castings which have been or are being made from virgin metals can be made from ingot without detrimental lessening of the physical properties. Of course, certain castings call for chemical specifications which are not within the range of ingot manufacture, but most of these chemical specifications are more traditional than essential.

In the past, too much stress has been placed upon chemical characteristics of metal when it really was subservient to foundry practice in obtaining the desired physical properties. Time and time again, we have obtained a variation of as high as 10,000 lbs. per square inch in tensile strength from the same pot of metal, merely by varying the pouring temperature; and there certainly was no change in the chemical analysis of the various test bars poured.

In line with this, a special committee of the American Society for Testing Materials, working in conjunction with the Non-Ferrous Ingot Metal Institute, has found that there are about six hundred different specifications for brass and bronze ingots, which no doubt can be reduced to about thirty or less. Supposedly, at various times castings have been analyzed and these analyses set up as specification without rhyme or reason.

Ingot vs. Virgin Metal

Without question, copper is the most delicate of the metals used in the manufacture of brass and bronze, due to its tendency to absorb gases readily—both oxidizing and reducing gases. Foundrymen know that as the copper content of castings increases, the difficulty with non-metallic impurities also increases.

They seldom have trouble with low-copper-content castings in so far as non-metallic impurities are concerned. Most of the grief in the much-abused manganese bronzes is due to improper gating and pouring temperatures and not to non-metallic impurities.

In melting virgin metals, the copper is melted first and the tin, lead and zinc added later. The copper may be thoroughly oxidized before the latter is added. This is partially avoided by the use of ingots as the copper, tin, lead and zinc are thoroughly alloyed or mixed before placing the charge into the furnace. As the latter are natural deoxidizers for copper, there is thus greater opportunity for obtaining sound castings when ingots are used.

Again, in the use of virgin metal, the copper, tin, lead and zinc must be weighed separately. This may work havoc if chemical analysis, uniformity of product and maximum physical properties are desired; if a mistake is made in weighing, the chemical analysis is "thrown off," and often the change in properties of the alloy seriously affects machine-shop operation. This is not true when ingots are used, for if a mistake is made in weighing there is simply more or less metal without affecting the analysis in the least.

We do not wish to convey the impression that virgin metal cannot be used successfully. We merely wish to point out the fact that ingot is more "fool proof."

In Table 1 it will be noted that we obtained practically

the same physical properties from test bars poured from ingot and from virgin metal where they were both melted and poured under the same conditions. Standard 85-5-5-5 was used.

TABLE 1, PHYSICAL PROPERTIES OF VIRGIN AND INGOT METAL MELTED AND POURED UNDER SAME CONDITIONS

	T. S. lbs. per sq. in.	Elong., Per Cent	Brinell.	P. T., degs. Fahr.
Virgin alloy	33,300	23.0	57.5	2100
Ingot alloy*	32,250	21.0	57.5	2075

*Average of 28 heats.

In passing, we must not overlook the fact that, granting all things being equal in so far as physical properties and good castings are concerned, considerable saving can be made by using ingot instead of virgin metals of the same composition. In these highly competitive days this may determine the difference between a profit and a loss for some foundries.

Has "Life" Been "Burned" Out of Ingot Metal?

We often are confronted with the argument that the secondary metal from which ingot is made has been remelted so many times that the "life" has been "burned" out. "Burnt" metal is really a misnomer. What is really meant is oxidized metal.

We may oxidize or volatilize some of the constituents, particularly zinc and lead, but we do not burn brass like we do steel. In the latter it happens in the solid state when, during a heat-treating operation, the temperature is brought up to such a point that gases get into the steel and separate the crystals. When such a condition is found in brass, it is more often due to furnace atmospheres and excessive pouring temperatures.

The results given in Table 2 prove that, for practical consideration, the number of times metal is remelted does not affect the physical properties if carried out under the proper conditions and if the chemical composition is maintained.

Standard 80-10-10 and 85-5-5-5 ingots were remelted ten times, each time some test bars were poured and the balance of the metal was poured into ingots and remelted. Zinc, tin and lead were replaced as found necessary. It will be noted that the physical properties are practically the same.

TABLE 2, EFFECT OF REMELTING ON PHYSICAL PROPERTIES OF INGOT METALS

	80-10-10			85-5-5-5	
	T. S. lbs. per sq. in.	Elongation, Per cent.		T. S. lbs. per sq. in.	Elongation, Per cent.
1	29,600	9.0	1	31,050	23.0
2	29,850	9.0	2	31,500	21.0
3	29,950	10.0	3	32,000	20.0
4	28,500	10.0	4	33,000	19.0
5	29,200	11.0	5	32,200	22.0
6	29,950	9.0	6	31,700	20.0
7	30,600	10.0	7	32,000	20.5
8	29,950	10.0	8	32,600	19.0
9	30,500	10.0	9	33,400	21.0
10	31,500	9.0	10	32,100	22.0
Usual Specification	28,000	8.0			

Conclusion

We do not feel that in this short discussion we have covered all the details regarding the application of ingot to industry. We believe, however, that we have shown that just as good results can be obtained from ingot as from virgin metal, and that it is more "fool proof" in its use, in addition to effecting a saving in money.

We have also proven that metal can be remelted any number of times without deleterious results. This fact should eliminate the old "bugaboo" that ingots are inferior because they are made from secondary metal which may have been remelted many times.

The pendulum is swinging the opposite way. Today, foundrymen who still use virgin metal either are remelting it into ingot before using, or are purchasing an ingot made from virgin metal.

In closing, we might again repeat that trouble can occur in a foundry regardless of what metal is being used, but that, with proper foundry practice, there will be less trouble with ingot. Any foundry can thus avail itself of the benefits derived from the chemical control and metallurgical knowledge and experience put into its product by the large reputable ingot manufacturers, if it does not have this technical control itself.

World's Largest Propellers Completed

The testing of the last of the propellers for the new Canadian Pacific liner "Empress of Britain" took place recently at the works of the Manganese Bronze Company, Ltd., Millwall, Eng. The "Empress of Britain" will have four screws, the two inners, weighing 28½ tons, being the largest ever made. The two smaller ones will weigh over 10½ tons each. The latter are designed for 194 r.p.m. with 10,000 i.h.p. on each shaft. The revolutions of the large blades will be 146 per minute with an h.p. of 22,000 for each. Their diameter is 19 feet 3 inches with a surface area of 148 square feet, and their caps weigh 952 lbs. In the balance test it is possible for a child exerting pressure with a finger to start these giants revolving.

A special process bronze developed by the Manganese Bronze Company is used in the production of these propellers, and a spare set of screws for the same ship is now being started upon. It was found impossible to send these propellers by rail to the shipbuilders, so they had to be shipped from London to the Clyde. Even then they had to be tilted in the hold of the ship owing to their colossal size.

Previously the "Empress of Japan," launched last November, had the largest screws in the world, weighing 22½ tons.—A. C. B.

Canal Water

Q.—Can you tell me anything about the effect of canal water on nickel solutions?

A.—There is no textbook on plating that will give you the information you desire. It is necessary to have an analysis of a sample of the water to determine the effect it will produce if added to a nickel solution. In general, it might be stated that in preparing or replenishing any solution it is best to use water that is as pure as it is possible to obtain, distilled water being excepted.

—Oliver J. Sizelove.

Overcoming Alloy Ingot Troubles in the Brass Foundry

Problems Met and Solved by Careful Selection of Ingot

By WILLIAM E. PAULSON
President, Thomas Paulson and Son, Inc., Brooklyn, N. Y.

FROM A PAPER READ AT THE CLEVELAND MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, MAY 12-16, 1930.

THESE remarks are intended as a purely non-technical discussion of the difficulties experienced by one foundry in producing nonferrous castings using alloy ingots. The writer feels that this subject is a timely one, inasmuch as other foundries undoubtedly have had similar experiences with the use of alloy ingots. It is through the aggregate of experience and knowledge, of course, that we mutually better our methods and products.

Our foundry, to begin with, has been producing high-grade products for over forty years. Up until a few years ago, we held to the opinion that it was necessary to use virgin metal in order to procure the results we sought to accomplish.

Why Alloy Ingots Were Considered

A short while ago, however, price competition forced us to consider means for reducing our costs, while still continuing to maintain the quality of our product. Thus we turned to the use of alloy ingots, although it must be admitted that we adopted this policy with misgiving, having in mind the homely saying that "You can't make a silk purse out of a sow's ear."

Ingots were procured from a well-established concern of unquestionable reputation. It is only fair to state here that none of the writer's comments are intended to reflect in any way upon this ingot producer's skill or integrity.

First Observations

The first castings which we made from the ingots were, of course, examined with great interest. For one thing, in skimming the molten metal it was observed that more than the usual amount of dross was removed. Also, the castings, when taken from the mold and cleaned by the sand blast, exhibited a decidedly different color than was the case with castings poured from virgin metal mixtures.

In composition, the mixture which we are now considering consisted of copper 77, tin 8, and lead 15. An alloy consisting of copper 80, tin 10 and lead 10 behaved in the same manner.

After being reassured by the ingot producer that the conditions observed were not detrimental to the metal, the castings were shipped. As production continued, it was further observed that the surface discoloration was not consistent. That is to say, different heats exhibited marked differences in color, despite the fact that chemical analyses indicated close adherence to specifications.

Causes of Failures

After a number of lots of ingot metal castings had found their way into the machining departments of customers, it was not long before complaints began to come in with distressing frequency. The experiences reported by several shops were substantially identical.

No two lots of castings machined the same. All users were agreed that the machining time was increased. In too numerous instances, reports came in to the effect that many castings were unmachinable. Many castings, of course, were returned for credit, so that the anticipated foundry economies were wiped out and, indeed, production costs increased.

All Impurities Excluded

At this stage, metal specifications were prepared excluding all impurities known to be detrimental. These impurities included iron, antimony, nickel and phosphorus.

We were assured by the ingot producers that, with rigid adherence to these specifications, the difficulties we had been encountering would not recur. Feeling confident that this contention was correct, we proceeded with our orders using another ingot metal.

Difficulties Persist

Our hopes were somewhat shaken to find, first, that the surface color was little improved. Also, customers using the castings reported little improvement in machinability. We watched many machining operations at this stage of the work, and we were convinced that the claims made as to working difficulties were well founded.

It was then decided to call in a new source of ingot supply, and with this producer our previous troubles were discussed at great length. It is well known that those of us who are engaged in foundry work seldom succumb to discouragement, so with new ingot we again proceeded, with renewed hope. However, it was in vain, for the same troubles immediately asserted themselves.

Trouble Is Traced Down

It is well to mention here that machining difficulties had manifested themselves in cutting tools being quickly dulled. Examination of the machined surfaces showed small spots that appeared very hard. Many of these spots could be seen with the naked eye, while some could be detected with an ordinary magnifying glass and others were revealed only by the microscope.

It had now become only too apparent that this condition had to be remedied immediately if customers were to be retained. Several had already placed business elsewhere.

Present Practice Satisfactory

At this time, we are using ingots in producing castings in the two alloys discussed in this paper, and these castings are apparently the equal of virgin metal products. This result is being accomplished by the use of specially prepared metal.

No turnings enter into the composition, nor is any red-metal alloy scrap permitted. The mixture is prepared from clean copper scrap and solder metal, with necessary additions of tin and lead, and the whole bath is carefully refined in a reverberatory furnace.

The conclusion that has been forced upon the writer confirms his belief, held prior to the use of the alloy ingot, that virgin metals or their equivalent (the latter obtained by preparing ingot as described above) are absolutely essential for production of best quality castings.

Discussion

The consensus of opinion at the meeting was that the trouble was due to minute amounts of impurities in the metal. The cleaner and purer the metal, the better the castings.

Specifications for impurity limits will minimize or eliminate troubles. It is advisable, also to control casting practice closely when using ingot metals.

Drinking Vessels of Colonial America

This Is the Fifth and Last of a Series of Articles on Drinking Vessels of Olden Times

By A. F. SAUNDERS
Designer for the Benedict Manufacturing Company, East Syracuse, N. Y.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE drinking vessels of Colonial days give an interesting insight into the customs of our early American forbears and the variety and importance of these articles of daily use may be judged by the great number mentioned in old family inventories and wills, as well as from the many actual examples handed down to the present generation.

These vessels differ both in form and material, some being made of horn, wood, pewter, gold and silver. Naturally those made in the precious metals are the finest and most interesting of any. Almost without exception they are shining examples of the artistic sense, the practical skill and the masterful craftsmanship of the Colonial silversmith.

Beakers, caudle-cups, mugs, tankards, flagons, all proclaim the fact that early America not only celebrated such joyful events as births, christenings, and marriages with brimming bowls, but also observed similar customs at funerals. Taverns and tankards were well-nigh synonymous and in view of these facts it may seem rather curious to most of us how so many of these purely domestic vessels found their way into church use. The beaker was the accepted form of communion cup used in the Dutch Churches of the New Netherlands, and occasionally performed the same service in the New England Colonies, though the English favored the goblet or standing cup; also caudle cups, and tankards were sometimes used for sacramental purposes.

Colonial Beakers

The beaker was one of the earliest forms of drinking cup made by the Colonial silversmith, and it varied in style according to the locality. Those of New England followed the form used in the mother country, while those made by the Dutch craftsmen naturally favored the models used in Holland. It is interesting to note the difference between the two styles, this difference being more pronounced during the earlier period than later when all the Colonies came under British dominance.

The first New England beakers were copied after the low, flat bottomed, straight cylindrical bodied styles in general use in England at that time. These cups were without a base and flared outward slightly at the lip. The earliest known Colonial made beaker, illustrated by Fig. 1, Plate 1, is a splendid example of this early type. It was made about 1659 by the celebrated Boston silversmith, Robert Sanderson. By the beginning of the eighteenth century the body of the cup became taller (6 to 7 inches) and assumed a gradual taper, with a more pronounced outward curve at the lip. The bottom remained flat and was supported on a moulded base. Ofttimes these beakers were beautifully engraved in a more or less conventional design, as indicated by the fine old beaker made about 1683 by John Hull, of Pine Tree Shilling fame (Fig. 2, Plate 1). This is practically a copy of the perfect type of Dutch Colonial beaker, as illustrated in the cup made by that renowned New York silversmith, Hendrik

PLATE I

1. A New England beaker of 1659. Probably the oldest silver cup made in this country. Made by Robert Sanderson.

2-4. Two silver beakers of early Colonial make. No. 2 was made about 1680 by the celebrated New England silversmith, John Hull; No. 4 was the work of John Edwards, about 1700.

3. A Dutch Colonial beaker made about 1710 by Hendrik Boelen of New York.

5. Two silver beakers of Early American make, John Potwine, 1698-1792.

6. A pewter mug of Colonial times, made about 1744.

7-8-9-10. Pewter tankard and flagons of early American make, 1700-1800.

Boelen, about 1710. Fig. 3, Plate I, is especially interesting, largely due to its handsome engraved decorations, consisting of bands of interlacing strap work, and three cartouche within which are figures of Faith, Hope and Charity, each group being designated by its Greek name. Within and about the strap work, and the cartouche are engraved leaves and flowers in an extremely artistic design.

Caudle Cups

The caudle, or posset cup, became popular in England during the reign of Charles II (1660-1685) when it was considered, next to the tankard, an indispensable possession of every English household. They received their

PLATE II

11. A silver caudle cup of early Colonial make, about 1700.
12. An early Colonial caudle cup made about 1668.
13. An early type of silver mug made by John Allen of Boston, in 1712.
14. A Dutch Colonial beaker in Silver made by Robert Roosevelt, in 1763.
15. A silver tankard, by Paul Revere, about 1770.

name from a warm drink, called "cawdel," or "caudle," consisting of thin gruel, mixed with wine, or ale, and sweetened and spiced. "Posset" was a mixture of hot milk, curdled with ale or wine with other additions. When warmed the curds floated above the liquor, and rising to the narrow part of the cup could be easily skimmed off, leaving the clear fluid at the bottom.

Caudle cups were made by the New England silversmiths as early as 1675. In form these cups followed closely the two styles used in England at that time. The earliest form of caudle cup was circular and bulbous, incurved at the base, and somewhat contracted at the lip, a form best described as gourd shaped. After 1675 a new style appeared; the sides of the cup became straight, curving inward at the foot. Both styles were fitted with two scrolled solid cast handles, which often had human heads on shoulders to serve as thumb pieces. Sometimes these cups were fitted with a flat cover, but they are very rare.

The embellishment of these cups varied greatly. Those of the bulbous type were usually embossed (or repousse) the design motif consisting of tulips, or other flowers, either in a free running design, or in scrolled panels. Another popular style of decoration was to prick, or punch the design in some simple pattern composed of dots, lobes, leaves, scrolls and concentric circles, usually arranged in panelled compartments and very effective. The straight sided cups were most often decorated with a spiral or vertical fluting around the lower part of the body and frequently there was a corded, or husked band just below the lip. Another style of decorative treatment, known as "cut-card" work was also quite popular between 1660 and 1700. This method of embellishment consisted of applique foliage resembling that of a pattern cut out of cardboard and applied. Figs. 11 and 12, Plate II, illustrate both the straight sided and bulbous form of this old time cup.

Mugs

Mugs were another popular drinking vessel in the Colonies. They are, perhaps, best described as small tankards, either cylindrical, or bellied in form, with but one handle and without a cover. Those of globular bodies undoubtedly had their origin in the stone ware jugs which, when mounted in silver, became so popular in England during the sixteenth century. Mugs of this shape were copied by the Colonial silversmith, but the greatest number were made tankard style, that is, straight tapering sides, and flat bottom with a moulded base; sometimes, the body was perfectly plain or it was girdled by a moulded band, or turned lines. Sometimes the bellied or bulbous shaped mugs were decorated with finely chased flutings, delicate cut-card work, in a foliated or scalloped pattern, just above the moulded base, and some of the Dutch style mugs were beautifully engraved; usually with the armorial bearings of the owner. The handles in general followed the broad style used on the tankards. Those on the earlier mugs (of which the Allen and Edwards mug, Fig. 13, Plate II, is a fine example), were most often in the form of a letter S—curve, sometimes in a flat strap form with a reeding or a notched rat-tail running down the back, or, again they might be semi-circular in section, like the tankard handles, but gradually developing into one of somewhat circular section. During the first quarter of the eighteenth century mug handles had changed generally to a double scroll form, often with an acanthus leaf, feather scroll or some other ornamental motif serving as a thumb rest.

Colonial Tankards

Colonial tankards followed in general style those of English make. Seventeenth century forms were broad, flat-topped and comparatively low. The heavy handle was usually strengthened by the addition of a long body drop. Thumb pieces varied from the early spiral forms to the eagle, lion, dolphin, and mask. The domed lid came into style early in the eighteenth century and it soon became the style to ornament the lid with a finial or knob, and to add a moulded band around the body. These vessels ranged in height from six to nine inches with a capacity of from one to three quarts. Fig. 14, Plate II, illustrates a tankard of this form. Unlike the beakers, the shape of tankards made by the early New York silversmiths were not, as might be supposed, Dutch, but were modelled after the purely English styles. Yet, they incorporated certain decorative features, which were distinctly American, such as the inlaying of gold and silver coins in the flat topped covers, also double and other monograms engraved on the covers and narrow bands of cut acanthus leaves, frequently accompanied by zigzag wire, applied above the moulded base, and the massive handles were decorated with swags of fruit, cherub heads, acanthus leaves, lions, etc., etc. The thumbpiece, used to open the cover, was usually of an elongated spiral or corkscrew, although sometimes a scrolled thumbpiece, after the English fashion, was used.

The Flagon

The flagon is an elongated tankard, and was made in both the globular and cylindrical forms. Their introduction into the Puritan churches of New England indicated the growing material prosperity of the Colonists, and the decline in their dislike for the sacramental vessels, which were in general use by the Church of England, and which were regarded by the early colonists as being too ostentatious, if not ritualistic. Most of the flagons owned by American churches are of English make, though some very handsome examples of early American make are also to be found. A fine one made by Joseph Moulton, about 1804, belongs to the Old South Church in Boston. This vessel is of cylindrical form with a domed and moulded cover, topped with a simple turned finial, a scrolled thumb piece, and a massive, yet graceful handle, ending in an oval disc ornamented with a cherub head in relief.

Black Jacks

Leather was perhaps the most curious material used in the fashioning of drinking vessels; pitchers, bottles, and drinking cups were made of it. But the jugs of heavy black leather, waxed and bound, and tipped with silver were the most interesting of all. They were very substantial, and some of them were very handsome vessels. In addition to the rich silver mountings around the mouth, or lip, they often had a silver shield for monograms or other inscription attached to the body. These leather jugs were commonly called black jacks. Like many other drinking vessels of English origin these leather jacks were copied by the Colonists, and the use of those of large size led to the amusing idea at one time believed in France, that "The English drank their ale out of their boots."

Close inspection discloses that the makers of these drinking vessels were not only craftsmen of taste, but also men who knew a great deal about the traditional forms of architecture of the classic period. The way the straight sides of a tankard or mug, for instance, spring out of the moulding of the vase, or the purely Greek quality of the curve to a bowl show that this work was not the product of mere copyists.

To quote so eminent an authority as Cass Gilbert, the noted architect . . . "The Colonial silversmiths were no common craftsmen, nor were they lacking in erudition. They knew their precedent and their proportions, and yet knowing worked with free hands, controlled only by knowledge of their art and by impeccable taste."

This ends the series of Mr. Saunders' articles on the development of drinking vessels of a "bygone" age. In the near future we hope to publish an article by the same author showing the progress in the design and manufacture of modern water cups and other vessels.

Soldering Porous Castings

Q.—Will you tell us of a solder harder than the ordinary lead-tin solder but having nearly the same melting point, which will be suitable for covering sand holes in brass castings? The castings are later polished and nickel plated.

If you know of no suitable solder, is there an amalgam paste that would be hard enough to permanently fill small sand holes and be capable of taking a nickel plate?

A.—We do not know of any satisfactory solder suitable for covering sand holes in brass castings better than pure tin. It must melt at a low temperature and adhere to the casting, and tin will do this better than any metal we know of.

There is paste, such as emery grindings and silica soda, for filling holes. Pastes are never satisfactory, however, as they spot out and show black spots when nickel plated.

Trusting this is the desired information.

W. J. Reardon.

Coloring Brass

Q.—I am trying to get a dip oxidizing solution to produce an orange color on brass plated steel, for an antique effect. On solid or sheet brass I have been able to obtain the desired color with potassium chlorate and copper sulphate, but it is not very successful on the brass plated steel. What do you advise?

A.—If you had sent a sample of the finish you desire, we would have been better able to give you a satisfactory answer.

If you are able to produce the finish on rolled brass stock and not on brass plated work, we would be inclined to think that the trouble is with the brass deposit and not with the dip that is used to produce the finish. We suggest that you try a copper deposit on the steel before brass plating and that you vary the temperature of the brass solution until a deposit is obtained that has the same percentage of copper and zinc that the rolled stock has.

Oliver J. Sizelove.

Chromium Data

Q.—We hear that platers are using a chromium solution that does not require the 113° Fahrenheit temperature. Can you tell us what this solution may be that can be worked, for ornamental work at least, at not over 75° Fahrenheit?

We note you advise the use of lead anodes. This would require new supplies of the chromic acid or other source of chrome. Is this necessary, and is it not possible to use metallic anodes as with other solutions?

You refer to a "high trivalent chromium content." We would appreciate knowing what is meant by this.

You state that the sulphate content may be reduced by adding the "calculated amount of barium carbonate." We do not see any reference to what may be meant by the "calculated amount." Kindly show us where this may be found.

A.—Formula No. 2 as given in Plater's Guidebook for chromium solution may be operated at 75° Fahrenheit with a cathode current density of 50 amperes per square foot, but best results will be had at 95° Fahrenheit and a cathode current density of 75 amperes per square foot. Why not operate the solution at the temperature and current density that has been found to give best results? This method is used with other solutions, so why not with chromium?

Antimony lead anodes have also been found from practical experience to give best results. If chromium anodes were used they would corrode or go into solution at a faster rate than the chromium could be deposited and the solution would build up in metal too fast.

In the chromium plating solution some of the chromium present in chromic acid is reduced at the cathode from a valence of 6 to a valence of 3, forming trivalent chromium.

To reduce an excess of sulphate from the solution, barium carbonate may be used. It is necessary to know the amount of sulphate present and if an excess is found, it may be reduced by adding twice the amount of barium carbonate for the amount of sulphate to be removed.

Oliver J. Sizelove.

A Connecticut Pewter Specialty Shop

Pewter Reproductions of Rare Pieces Carried On by Craftsmen of the Old Style

By F. A. WESTBROOK
Mechanical Engineer

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

IN addition to the manufacture of pewterware on a quantity production scale by large companies, it has also been resumed by smaller concerns on a scale directly comparable to the New England pewter shop of the eighteenth century. One of these is the Merwin-Wilson Company, of New Milford, Conn.

This is a comparatively small organization located in a country town in the Housatonic Valley. The number of people employed and the quantity of output are just about the same as with the old pewter shops of colonial times. As a matter of fact the shapes are exactly the same, as they are reproductions of the old designs. The only difference is that a few more machines are used than in the old days and electrical power has replaced the water

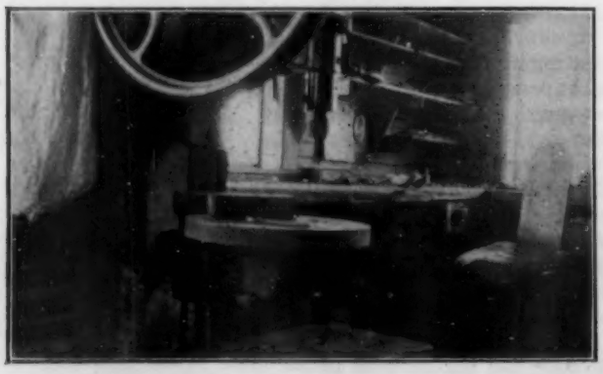
Samples of Work Done in the Shop

wheel. In other words, an extremely interesting and decidedly picturesque situation exists here which is entirely in keeping with the historical background of American pewter. This consistency is further accentuated by the fact that Connecticut, in the height of American pewter making, had more shops of this kind than any of the other original thirteen colonies.

The Merwin-Wilson Company was started about 1912, making prize cups and two or three years later pioneered in the reintroduction of pewterware. This company and the Vaughn shop in Taunton, Mass., were the only pewterers in the country for several years and were the active agents in starting the present vogue for pewter which has grown to such important dimensions during the last few years. Originally, as might have been expected, there was a good deal of sales resistance to pewter, but of course the re-education of the public taste has now progressed to a point where there is a steady demand. Investigation indicates that apparently the present interest in pewter is not just a passing fancy, as was at first supposed, but is on a basis which promises to continue more or less indefinitely. It is an interesting fact that, in the prize cup end of the business, it has been the experience of this company that where sterling silver is too expensive, people generally prefer pewter to silver plate because they feel that it is more sincere.

The Merwin-Wilson shop is a self-contained plant, dependent on no outsider except for raw materials, just as were the old ones. The founder, who has been on the job for eighteen years, makes the alloy of tin, copper and antimony in two kettles over coal fires. One kettle is used for casting plates, or ingots, and the other for casting in moulds. The plates are rolled into sheets by the motor-driven rolls. There is also a hydraulic press for dishes and other shapes which do not call for spinning. In addition to these there is a cutting machine as well as a small lathe for turning off rough surfaces.

Melting Kettle and Molds



Corner of Shop for Bench Work, Hammering and Soldering

The hand trimming and filing of castings and the hammering are done by two men at benches. There are three spinners, and 3 men who fit and solder spouts, handles and other parts. All this is on the first floor. Upstairs are the polishing operations and the stock room calling for 5 more men. Of course the number of employees varies somewhat from time to time but the number indicated is about the average. The idea is to have a small group of real craftsmen who are capable of turning out particularly high class work, comparable to that for which Connecticut was famous a hundred years ago.

As already stated, the output of this shop is exclusively accurate reproductions of famous early American pewter. In almost every case the various pieces are copied from genuine antiques which have been purchased for the pur-

pose or to which access has been secured. For instance, there is a pitcher reproduced from a specimen in Mr. Henry Ford's collection of originals at the Wayside Inn at Sudbury, Mass., another pitcher has been copied from an original made by Paul Revere and a third from one by R. Dunham of Portland, Me. A saucer candlestick has been copied from one in the possession of a New Milford family for more than a century and one of the mugs is a reproduction from one made in 1779 by H. Yale & Company and still in the possession of the descendants of the original owners. There is also a copy of a beaker made by Robert Boyle about 1752, a candlestick brought over in the Mayflower, a pitcher designed by Roswell Gleason, a plate by Samuel Danforth and copies of other pieces made by equally famous pewterers well-known to collectors but too numerous to mention.

All of these designs are extremely simple which, it goes without saying, constitutes most of their attractiveness. This reproduction of fine old pieces is, of course, highly advantageous from the manufacturing standpoint because there is no need of employing expensive designers and the copies are most attractive, in keeping within the historical background of the material and what the buying public is in most cases looking for.

Changes Effected by the New Tariff

A Comparison of the New and Old Duties on Products Relating to the Non-Ferrous Metals and Electroplating Industries

THE following list shows the changes from existing rates fixed in the Hawley-Smoot tariff bill upon which Congress completed its work on June 13, 1930. The items on which the rates are the same as in the existing tariff law are not included.

SCHEDULE 1.—CHEMICALS, OILS AND PAINTS

Commodity.	Rate of Duty—Fordney-McCumber Tariff, 1922.	Rate of Duty—Hawley-Smoot Bill, 1930.
Acids and acid anhydrides:		
Acetic acid containing not more than 65% acetic acid (lb.)	¾c.	1⅜c.
Acetic anhydride (lb.)	5c.	3½c.
Boric acid (lb.)	1½c.	1c.
Citric acid (lb.)	17c.	17c.
Formic acid (lb.)	25%	3c.
Tartaric acid (lb.)	6c.	8c.
Sulphide of arsenic (lb.)	Free	2c.
Chromic acid (lb.)	Free	25%
Stearic acid (lb.)	1½c.	25%
Alcohol:		
Hexyl (lb.)	25%	6c.
Aluminum sulphate, alum cake or aluminous cakes:		
Containing not more than 15% alumina and more iron than the equivalent of 1/10 per cent ferric oxide (lb.)	3/10c.	1/5c.
Ammonium compounds:		
Ammonium carbonate and bicarbonate (lb.)	1½c.	2c.
Synthetic gums and resins, n. s. p. f. (lb.)	25%	4c.+30%
Barium compounds:		
Barium chloride (lb.)	1¼c.	2c.
Barium oxide (lb.)	25%	2½c.
Mercurial preparations:		
Calomel (lb.)	45%	22c.+25%
Corrosive sublimate (lb.)	45%	22c.+25%
Other mercurial preparations (lb.)	45%	22c.+25%
Mercuric oxide (lb.)	45%	22c.+25%
Carbon tetrachloride (lb.)	2½c.	1c.
Chalk or whiting or Paris white:		
Dry, ground or bolted whiting (lb.)	25%	4/10c.
Coal-tar products, n. s. p. f. (lb.)	7c.+40%	3½c.+20%
Collodion and other liquid solutions of pyroxylin, of other cellulose esters or ethers, or of cellulose (lb.)	35c.	30c.
Cellulose compounds, including pyroxylin and other cellulose esters and ethers, combinations or mixtures:		
Ethers and esters:		
Butyl acetate (lb.)	25%	7c.
Amyl acetate (lb.)	25%	7c.
Vegetable glue (lb.)	1½c.+20%	2c.+25%
Ink and ink powders, n. s. p. f.:		
Printers' and lithographers' ink	20%	10%
Writing and copying ink	20%	10%
Ink and ink powders, n. s. p. f.	20%	10%
Magnesium compounds:		
Sulphate or Epsom salts (lb.)	½c.	¾c.
Oxide or calcined magnesia (lb.)	3½c.	7c.
Camphor, synthetic (lb.)	6c.	5c.
Oils, vegetable:		
Linseed or flaxseed and combinations and mixtures (lb.)	3.3c.	4.5c.
Precipitated barium sulphate or blanc fixe (lb.)	1c.	1¼c.
Cuprous oxide	25%	35%
Lithopone and other combinations or mixtures of zinc sulphide and barium sulphate:		
Containing 30% or more zinc sulphide (lb.)	1¼c.	1¼c.+15%
Potassium compounds:		
Citrate (lb)	25%	14c.
Chlorate (lb.)	2¼c.	1½c.
Permanganate (lb.)	4c. (2)	6c.
Nitrate or saltpeter, refined (lb.)	1½c.	1c.
Sodium	Free (3)	25%
Lithium, beryllium, and caesium	Free (3)	25%
Sodium compounds:		
Bicarbonate (lb.)	¼c.	Free
Citrate (lb.)	25%	12c.
Oxalate (lb.)	25%	2½c.
Phosphate (except pyro) n. s. p. f. (lb.)	½c.	¾c.
Silicofluoride (lb.)	25% (4)	1½c.
Sulphate, anhydrous (ton)	$2	$3
Dextrine, made from potato starch or potato flour (lb.)	2¼c.	3c.
Dextrine, n. s. p. f., burnt starch, dextrine substitutes (lb.)	1¼c.	2c.
Zinc sulphide (lb.)	1½c.	3c.
Calcium acetate, crude (lb.)	Free	1c.
Turpentine, gums and spirits of, and rosin	Free	5%

The abbreviation n. s. p. f. in above tables stands for "not specifically provided for"; the abbreviation n. e. s. stands for "not especially specified."

(2) Rate on potassium permanganate changed by Presidential proclamation from 4 cents to 6 cents per pound, effective Dec. 16, 1928.

(3) 25 per cent under Paragraph 5 to Dec. 4, 1928; thereafter free by court decision.

(4) Rate on sodium silicofluoride changed by Presidential proclamation to 25 per cent based on American selling price, effective Sept. 15, 1928.

SCHEDULE 2.—EARTHS, EARTHENWARE, GLASSWARE

Commodity.	Rate of Duty—Fordney-McCumber Tariff, 1922.	Rate of Duty—Hawley-Smoot Bill, 1930.
Crude magnesite (lb.)	15/32c. (1)	15/32c.
Portland, Roman and other hydraulic cements (100 lbs.)	Free	6c.
From countries imposing duties (100 lbs.)	Countervailing	6c.
Statues, statuettes and bas reliefs, wholly or in chief value of plaster of Paris, n. s. p. f.	35%	60%
Pumice stone and pumicite:		
Pumice, wholly or partly manufactured (lb.)	55/100c.	75/100c.
Silica:		
Crude, n. s. p. f. (ton)	$4.00	$3.50
For use as pigment (ton)	$7.50	Free
Fluorspar:		
High grade (ton)	$5.60	$8.40
Not exceeding 97% $CaFl_2$ (ton)	$8.40 (2)	$5.60
Mica:		
Unmanufactured—		
Valued above 15c per pound (lb.)	25%	4c.+25%
Manufactured—		
Cut (dimension sheets)	30%	40%
Splittings	30%	25% to 45%

Commodity.	Rate of Duty—Fordney-McCumber Tariff, 1922.	Rate of Duty—Hawley-Smoot Bill, 1930.
Graphite or plumbago:		
Lump, chip, or dust	20%	30%
Flake (lb.)	1½c.	1.65c.
Chemical and other scientific glassware:		
Lamp-blown advolumetric ware	65%	85%
Articles for chemical, scientific and experimental purposes, n. e. s.	65%	85%
Same, of fused quartz	30%	50%
Fused quartz tubes or tubing	30%	40%
Cast polished plate glass and polished window glass silvered and used as mirrors and looking-glass over 144 square inches:		
Not over 384 square inches (sq. ft.)	13½c.	15c.
Dutiable at minimum rate	35%	45%
Over 384 and not over 720 square inches (sq. ft.)	16c.	20c.
Dutiable at minimum rate	35%	45%
Over 720 square inches (sq. ft.)	21c.	23c.
Dutiable at minimum rate	35%	45%
Cylinder, crown and sheet glass, silvered and looking-glass plates over 144 sq. in.—		
Not over 384 sq. in. (sq. ft.)	13½c.	15c.
Dutiable at minimum rate	35%	45%
Over 384 and not over 720 sq. in. (sq. ft.)	16c.	20c.
Dutiable at minimum rate	35%	45%
Over 720 sq. in. (sq. ft.)	21c.	23c.
Dutiable at minimum rate	35%	45%
Plate glass, cast, polished, silvered, and looking-glass plates, exceeding in size 144 square inches—		
Not over 384 square inches (sq. ft.)	13½c.+5%	15c.+5%
Dutiable at minimum rate	40%	50%
Over 384 and not over 720 square inches (sq. ft.)	16c.+5%	20c.+5%
Dutiable at minimum rate	40%	50%
Over 720 square inches (sq. ft.)	21c.+5%	23c.+5%
Dutiable at minimum rate	40%	50%
Cylinder crown and sheet glass, silvered and looking-glass plates:		
Over 144 and not over 384 sq. in. (sq. ft.)	13½c.+5%	15c.+5%
Dutiable at minimum rate (sq. ft.)	40%	50%
Over 384 and not over 720 sq. in. (sq. ft.)	16c.+5%	20c.+5%
Dutiable at minimum rate	40%	50%
Over 720 square inches (sq. ft)	21c.+5%	23c.+5%
Dutiable at minimum rate	40%	50%
Electric lamps:		
Incandescent—		
Carbon filaments	20%	30%
Sand containing 95% or more silica and suitable for glass manufacture	Free	$2 ton

(1) Rate of duty on crude magnesite changed by Presidential proclamation from 5/16 cent per pound to 15/32 cent per pound, effective Dec. 10, 1927.

(2) Rate of duty on fluorspar containing not more than 93 per cent calcium fluoride changed by Presidential proclamation from $5.60 per ton to $8.40 per ton, effective Nov. 16, 1928.

SCHEDULE 3.—METALS AND MANUFACTURES OF

Commodity.	Rate of Duty—Fordney-McCumber Tariff, 1922.	Rate of Duty—Hawley-Smoot Bill, 1930.
Tungsten metal, tungsten powder and tungsten carbide (lb.)	60c. lb. on tungsten content +25%	60c. lb. on tungsten content +50%
Fourdriner wires	30%	50%
Aluminum utensils (lb.)	11c.+55%	8½c.+40%
Silver plated hollow ware	40%	50%
Copper, brass, steel or other base metal	50%	40%
Buckles for belts, trousers, waistcoats, shoes, or slippers:		
Valued at 50c to $1.66⅔ per 100 (100)	10c.+20%	15c.+20%
Pens, metallic, except gold:		
With nib and barrel in one piece (gross)	15c.	20c.
Without nib and barrell in one piece of plain or carbon steel (gross)	12c.	15c.
Of other metal (gross)	12c.	18c.
Electrical machinery	30%	35%
Knives:		
Pen, pocket, pruning, budding, eraser, manicure and other knives with folding blades—		
Valued not over 40 cents per dozen (each)	1c.+50%	1¼c.+50%
Razors:		
Blades for safety razors (each)	1c.+30%	½c. & 1c.+30%
Other razors and parts of—		
Valued at 75 cents and less than $1.50 per dozen (each)	25c.+45%	25c.+30%
Valued at $1.50 and less than $3 per dozen (each)	30c.+45%	30c.+30%
Valued at $3 and less than $4 per dozen (each)	35c.+45%	35c.+30%
Valued at $4 or more per dozen (each)	45c.+45%	45c.+30%
Surgical instruments:		
Surgical instruments and parts, n. s. p. f.	45%	55% (1) 70%
Dental instruments and parts	35%	35% (1) 60%
Drawing instruments	40%	45%
Pliers, pincers and nippers valued at more than $2 per dozen (each)	60%	10c.+60%
Pliers, pincers and nippers valued at not more than $2 per dozen (each)	60%	5c.+60%
Muzzle loading shotguns, rifles and muskets and parts thereof	25%	Free
Bells (except church bells and carillons) finished or unfinished, and parts thereof	40%	70%
Shotguns and rifles valued at over $50 each.	$10+45%	20%+45%
Pistols, automatic, magazine or revolving valued not over $4 each (each)	$1.25+55%	$2+55%
Pistols and revolvers—parts and fittings:		
Valued not over $4 each (each)	$1.25+55%	50%+55%
Valued $4 to $8 each (each)	$2.50+55%	50%+55%
Valued over $8 each (each)	$3.50+55%	50%+55%
Automobiles, motorcycles and parts, except tires and glass	25%+ Countervailing	10%or25%+ Countervailing
Machinery:		
Stationary "Turbine"	15%	20%
Marine	15%	20%
Steam engines, n. s. p. f., Turbine	15%	20%
Cotton manufacturing machinery	35%	40%
Wool manufacturing machinery	35%	40%
Other textile machinery and parts	35%	40%
Printing presses, n. s. p. f.	30%	25%
Machines, n. s. p. f. except agricultural	30%	27½%
Aluminum:		
Crude scrap and alloys (lb.)	5c.	4c.
Plates, sheets, bars, strips, rods, coils and blanks (lb.)	9c.	7c.
Circles, disks, rectangles and squares (lb.)	9c.	7c.
Aluminum, foil	35%	40%
Metal powder in leaf (100 leaves)	6c.	6c.+10%
Phosphor copper or phosphorus copper	Free	3c.
Types	20%	30%
Nickel, oxide	1c. lb.	Free
Zinc ore:		
Containing under 10% zinc (lb.)	Free	1½c.
Containing 10% and less than 20% zinc (lb.)	½c.	1½c.
Containing 20% and less than 25% zinc (lb.)	1c.	1½c.
Containing 25% or more zinc (lb.)	1½c.	1½c.
Mechanics' tools	40%	45%
Manufactures of metal, n. s. p. f.:		
In chief value of, or plated with platinum, gold or silver, or colored with gold lacquer	60%	65%
In chief value of base metal, not plated with platinum, gold or silver, and not colored with gold lacquer	40%	45%
Punches, shears and bar cutters, intended for used in fabricating structural or other rolled iron or steel shapes	30%	40%

(1) If chief value of glass.

SCHEDULE 15.—SUNDRIES

Commodity.	Rate of Duty—Fordney-McCumber Tariff, 1922.	Rate of Duty—Hawley-Smoot Bill, 1930.
Asbestos manufactures:		
Asbestos	30%	40%
Packing fabric (including expanding, block and cloth packing)	30%	40%
Brooms	15%	25%
Brushes:		
Paint brushes	45%	50%
Other brushes	45%	50%
Brushes having pyroxlin handles (each)	60%	2c.+50%
Handles of pyroxlin for brushes (each)	60%	1c.+50%
Bristles, sorted, bunched or prepared (lb.)	7c.	3c.
Granulated or ground cork	25%	1c.-3c. lb.
Cork insulation	30%	2½c. bd. ft.
Cork tile (lb.)	30%	Over ⅛-in. thick, 6c.; ⅛-in. thick or less, 10c.
Manufacturers of cork, n. s. p. f.	30%	45%
Jewelry and related articles (not gold or platinum), valued over 20c doz	75% to 80%	1c. each +50% (2)
Combs composed of horn or of horn and metal	50%	1c.+25% 2c.+35%
Electrical insulators and other articles of synthetic phenolic resin, etc., n. s. p. f. (lb.)	30%	25c.+30% 50c. +40%
Band, orchestra and other musical instruments except violins, violas, violoncellos, pianos, organs and carillons:		
Cases for musical instruments	40%	50%
Carillons, and parts	40%	20%
Phonograph needles	45%	8c., 1,000+45%
Mechanical pencils made of base metals, not plated with gold, silver or platinum (gross)	45c.+20%	45c.+40%
Mechanical pencils	45c. doz. +25%	45c. gross +40%

(2) Plus 3/5 cent per dozen for each cent the value exceeds 20 cents per dozen. The equivalent ad valorem rate is 110%

Note on Abbreviations

The abbreviation n. s. p. f. in above tables stands for "not specifically provided for"; the abbreviation n. e. s. stands for "not especially specified."

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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PALMER H. LANGDON.....Editor and Publisher
ADOLPH BREGMAN.....Managing Editor
THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

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Vol. 28 New York, July, 1930 No. 7

Contents

Platers Gather at Washington for Convention 319
Members from all States and Canada Attend Excellent Educational Sessions—Trips and Other Features Make Everybody Happy.

Variations in Thickness of Nickel Deposits. 325
Experiment to Determine Different Thicknesses of Deposit in Different Parts of Tank.—Part 2.
By LELAND E. GRANT and VERNON E. GRANT

Plating on Carbon 327
By OLIVER J. SIZELOVE

Tin Plating 327
By OLIVER J. SIZELOVE

Cloudy Nickel 327
By OLIVER J. SIZELOVE

Testing Materials Society Meeting..... 328
A Report of the Thirty-third Annual Meeting in Atlantic City, June 23-27, 1930.

Casting Alloys 330
By W. J. REARDON and H. M. ST. JOHN

Deep Etch Test of Brass..... 331
A Rapid and Simple Method of Testing Brass Castings for Soundness.—Part 2, Conclusion.
By W. F. GRAHAM and L. A. MEISSE

Flux Spots and Tin Oxide Blots..... 333
By WALLACE G. IMHOFF

Plating Inside of Tube 333
By OLIVER J. SIZELOVE

Application of Brass Ingot Metal in Industry 334
The Advantages of Ingot Metal Over Virgin Metal in the Foundry.
By WILLIAM ROMANOFF and C. O. THIEME

World's Largest Propellers Completed.... 335

Canal Water 335
By OLIVER J. SIZELOVE

Overcoming Alloy Ingot Troubles in the Brass Foundry 336
Problems Met and Solved by Careful Selection of Ingot.
By WILLIAM E. PAULSON

Drinking Vessels of Colonial America..... 337
This is the Fifth and Last of a Series of Articles on Drinking Vessels of Olden Times.
By A. F. SAUNDERS

Soldering Porous Castings..... 339
By W. J. REARDON

Coloring Brass 339
By OLIVER J. SIZELOVE

Chromium Data 339
By OLIVER J. SIZELOVE

A Connecticut Pewter Specialty Shop..... 340
Pewter Reproductions of Rare Pieces Carried on by Craftsmen of the Old Style.
By F. A. WESTBROOK

Changes Effected by the New Tariff..... 341

Editorials 344

New Books 346

Shop Problems 347

Patents 349

Equipment 350

Solution Control Apparatus
New Silicon Bronze
Combination Grinder and Buffer
Improved Sandblast Equipment
New Black Lacquer
New Plating Barrel
"Silveroid" New Metal Product
New Buffing Wheel
New Aluminum Alloy
New Overhanging Type Lathe
Combination Coke and Oil Melting Furnace
New Light Alloy of High Strength
Grinders and Polishers
Oil Regulating Valves

Associations and Societies..... 354

Personals 355

Obituaries 356

News of the Industry..... 357

Review of the Wrought Metal Business.... 363

Metal Market Review 363

Metal Prices 364

Supply Prices 366

THE METAL INDUSTRY is regularly indexed in The Industrial Arts Index

Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 77.

Editorial

How Is Business?

In these times, when the question "How is Business?" is the most active one of the day, we have the benefit of statements from an authoritative body with facilities for giving us information as accurate as can be obtained without undue delay. The periodic statements of the National Business Survey Conference of Washington, D. C., headed by Julius H. Barnes, are followed with deep interest throughout the country. This Conference expresses no opinions; it simply states the facts as it has found them. We give their findings, in brief, of the conditions in various fields, as the consumption of metals and metal coated products is so dependent upon a variety of industries.

Interest rates are low. This is partially the result of a plenitude of funds and also the lack of need by business, due to the slow pace of operations. Savings deposits are about the same as they were a year ago. Building and loan associations seem to be in better condition. Installment financing is less than last year, reflecting the decrease in sales of automobiles, radio, furniture, etc. Collections are tighter. Life insurance placed in May, 1930 was below May, 1929, but the total average for the calendar year is 1.3% higher. Fire insurance writing has fallen off about 9%.

Non-residential building is lower than last year by about 9%. Public utilities building increased 20% and residential building decreased about 45%. Total building construction of all classes was off about 17%. Permits for alterations, additions and repairs are on the increase.

Concrete pavements and road yardage are markedly ahead of any previous year, from 20% to 25%. Structural steel is fluctuating, inquiries in June being high, orders in May being above April, although 12% under May 1929 and shipments in May being under April 1930 and 1929. Such products as sanitary ware, plumbing fixtures, plate glass, lumber and other products for the residential building trade have fallen in conformance with the drop in residential building.

Carloadings for the four weeks ending June 14 were about 12% below 1929. Shipbuilding is off about 12% as compared with last year.

Electric power output has been running at the same level as 1929 for the past nine weeks. Consumption of manufacturing plants during May was 1% under April and 13% under May of last year. The groups showing increased consumption of power during May over April were food products (15%), chemical products (5%) and paper and pulp (4%). Sales of gas, natural and artificial, are holding their own with last year. Gasoline stocks are high due to improved refining processes which have offset the seasonal increase in consumption. Bituminous coal production is 12% below 1929. Anthracite production in May was 30% higher than in April and only 1% below May, 1929. Prices are low.

Prices of metals, copper, lead and zinc, are low. Shipments of copper in May were 50% greater than in April but stocks increased 1% while production was unchanged. Lead production declined 10% during May with stocks showing an increase, now up to 30 days' supply. Zinc stocks increased by 10% of the month's production. Pig iron production for the first 5 months of 1930 was 14.5% below 1929 (a record year) but was almost equal to 1928, a good year. May production was within 1% of production in May 1928, but 17% below May 1929.

Automobile production for 1930 so far is 30% under 1929, but higher than any other year except 1926. Low priced cars form an unusually large proportion of the total. Motor equipment and supplies receded in May below April but are above average for the three previous years. Stocks of passenger cars in the hands of dealers are 18% lower than they were a year ago.

The rubber industry reports business in June about even with May 1930 and 30% below June 1929.

Machinery building is operating between 65% and 70% of capacity with inquiries and orders in May less than in April. Farm implement sales are falling off. Retail hardware sales are about 4% under May 1929. Seasonal hardware at this time is about equal to 1929, but construction hardware is operating at about 65%.

Payrolls in the chemical industries in May are about the same as in April, 3% less than in May 1928 and 7% less than in May 1929.

Electrical manufactures in May are somewhat below the corresponding part of 1929 but approximately 20% over 1928. Electrical refrigeration is active; radio and other appliances are at a seasonal low point. Retail trade in department stores in May was about equal to May of last year.

Exports for May were about 3% below April and 16% below May 1929. The business depression is worldwide, with some signs of recovery in France, Sweden, Jugoslavia, Czechoslovakia, Switzerland and Denmark.

The above is an unbiased, simple statement of the facts, which although not glittering, must be known. The metal trades as a whole feel that a good recovery is due in the fall.

The New Tariff

In this issue on page 341 will be found a list of the changes effected by the new tariff on metals, metal products and supplies which are used by those trades. These schedules have occasioned more disagreement than any bill in recent years, the advocates of domestic business contending that higher tariffs are necessary, while the proponents of our growing foreign trade insist that it is time for a reversal of our ancient policy of the highest possible tariff.

To attempt a statistical summary of such a complex thing as the tariff would be of little avail. Percentages would be misleading and almost meaningless unless they were weighted for the quantity of the product involved in each particular case. Only time can determine these quantities, under a test of the new tariff, which makes judgments at this time no more than guesses. In a general way tendencies of the new tariff bill can be summarized as follows:

Chemical—Increased about 25%, with a few decreases like aluminum sulphate, collodion, inks and ink powders, silica, etc.

Ceramics—Upward.

Metals and metal products—Most of the changes upward with the exception of aluminum and aluminum products which are reduced.

The general tendency of the bill is, as everyone knows, to raise the existing rates. It is noteworthy, however, that the rises are not so great that the exercise of the presidential privilege of 50% revision could not put them below the previous figures. It is the clearly expressed intention of President Hoover to submit this schedule to the

reorganized tariff commission for their analysis and to use his power within the limits allowed, to conform with their judgment.

Even the strongest advocates of the tariff bill do not claim that it is perfect. Drawn as it had to be under our present system, by a political body subject to local influences, scientific determination of rates was clearly impossible. It is noteworthy, however, that some of the well known advocates of high tariffs are also dissatisfied with it. It is our hope that a properly constituted tariff commission working under conditions suitable for such a research project, will eliminate the inequities and place the tariff on a sound and scientific basis.

The Copper Market

The press continues to publish columns and columns about the copper market, giving a variety of reasons for its past decline and predictions for its future. Most of this space is wasted except that the subject continues, of course, to have a large amount of "reader interest." The price of copper fell after the efforts of the producers to hold it up had failed, because of the constantly mounting inventories piled up by the high production, simultaneously with the greatly decreased demand. If this process is reversed, copper will rise, we hope not too rapidly, for the good of all concerned, to a fair price again.

The immediate obstacles in the way of recovery are the large stocks on hand of raw metal and the continued small demand. Production has fallen off but not enough to counterbalance the decreased consumption.

In addition we have the far from unimportant influence of scrap copper. Copper has such a high reclamation value that now the electrolytic refineries have recognized it as a regular part of their raw material. In 1926, copper from scrap totalled 3.9 per cent of the total produced by the refineries in North and South America, according to statistics from the National Association of Waste Material Dealers. In 1929, it rose to 6.3 per cent. The first 4 months of 1930 it totalled 8.6 per cent. The introduction of as much as 9 per cent of this "outside" influence is far from a small factor.

Speculation is rife about the effect of the growing output of the African mines on the world copper market. Some believe that they will have a permanently depressing effect as their output will grow faster than world consumption. Others, like L. Vogelstein, chairman of the American Metal Company, feel certain that African production will be needed for the increasing world's demand, particularly for electrical equipment.

Predictions for the long pull are largely academic. It is certain, however, that the copper industry has every need of strong and steady guidance.

The Silver Decline

In these days of falling prices, it seems queer that any commodity should receive special attention because it is on a decline. Silver, however, has achieved that doubtful honor because of the depths to which it has fallen. Silver, near 33c an ounce, is no longer a product as almost no mines can afford to operate on such a basis. If this price should stand, silver will become a by-product only, produced by the copper, lead and gold mines.

Silver is an unfortunate member of our metal family. The decline in its price, according to the Department of Commerce, is the result of a lessening demand rather than an abnormally increasing supply. Nor is this lessening demand the fault of the silver manufacturers, who have increased their sales in recent years. It has been caused by the demonetization of silver by the principal nations of the world.

The chief sufferers in the sharp drop which has recently occurred are India and China because their coinage is still so largely silver. Mexico has also been pinched because it is such a large producer. The United States, the second in the world's producers of silver, is now shouldering its share of the burden. The revenue of the mines has fallen and the inventories of the manufacturers have shown heavy losses.

Plans are afoot for intensive development of industrial uses for silver, but these plans necessarily take time to work out. The silver producing and consuming industries have ahead of them a stern fight.

Protection Against Unemployment

A unique and comprehensive plan has been developed by the General Electric Company designed to make funds available for employees during times of need or unemployment. The money will be raised by equal contributions from employees and the company. At the same time a plan is being put into operation by the company, to minimize the causes and effects of unemployment.

The employee pays into a trust fund approximately 1 per cent of his actual earnings. The company contributes an equal amount. Three per cent of the fund will be available for relief of those in need, 27 per cent for loans to employees and 70 per cent for unemployment.

At the same time the efforts of the company will be directed toward stabilizing employment. In busy times they will add employees as slowly as possible. They will transfer employees to busy departments from slack departments. They will resort to overtime as much as possible before increasing the working force. They will postpone plant renewal and maintenance work as much as possible, employing the men on regular production.

When work slackens, they will cease hiring; cut out all possible overtime; transfer help from slack to busy departments; stimulate sales departments to secure customer co-operation and get business for future delivery; build up standard apparatus for stock; use men on maintenance and repair work, bringing the plant and equipment up to a high standard; cut the normal week if necessary down to 50 per cent before laying off help; proceed with construction of plant increases, using their own men as much as possible; if necessary drop new employees, single people with no dependents, first.

Necessarily, the above description is not complete as lack of space prevents an exhaustive analysis of the plan. Only time will tell how successful it will be and what changes and modifications may be necessary. It is, however, a noteworthy attempt to ameliorate the worst of our economic evils and one of the most destructive of our general business welfare—unemployment.

Electroplaters' Convention

The American Electroplaters' Society convened at Washington, D. C., from June 30 to July 3 and all the members and others who attended could not have failed to profit from the various educational sessions, plant visits and other features which marked the Association's eighteenth annual get-together.

The papers presented were of the best type, each contributing some important phase of the art and science of electrodeposition or other form of finishing. The value of the informative sections of the program, and the interest compelled by the entertainment succeeded in overcoming the annoyance of the extremely hot weather which is always an accompaniment of summer in Washington.

New Books

The Aluminum Industry, by J. D. Edwards, F. C. Frary and Zay Jeffries. Published by McGraw, Hill Book Company, in 2 volumes. Price $12.

REVIEWED by M. G. GORSON

It rarely happens that an author is called upon to review a book on the same subject which he has treated, by other persons. However, the reviewer considers it a great honor and pleasure to report on a treatise which is far superior to his own, and which can be considered a successful start in the development of a really exact technical literature.

The praise which is due this work, written by the members of the Aluminum Company of America's technical staff, is not unmixed with a feeling of envy for the men who have succeeded in turning out a book nearly free from shortcomings. On the other hand, readers will surely excuse the failings of the reviewer's own book, for he did not have access to the amazing amount of factual material which the Aluminum Company of America put at the disposal of its own metallurgists.

To illustrate, previous authors could scarcely approach a manufacturer for information as to the composition of their die-casting alloys. But the authors of the present book had not only the results of their own experiments, but probably also the cooperation of all die-casters buying aluminum or aluminum alloy ingots from the most important producer in the whole country.

Or, let us consider the electrolytic production of aluminum. It is comparatively simple for an author to compile theoretical equations on the process, add schematic drawings of the furnaces, and thus to prepare a textbook for the use of a student learning the fundamentals of metallurgy. But of what use could such compilation be to an engineer preparing a design of a reduction plant? A slight mistake of construction or an error in process might occasion the use of fourteen kilowatt hours per pound of aluminum, instead of the seven-and-one-half possible under good conditions. Even at a half cent per kilowatt—a rather low cost for energy—there would be a loss of three cents per pound, which, over a period might spell death to a reduction plant. This book, written by men who have had close contact with the reduction process, tells us what the limits of voltage and current factor should be, and also gives enough material for the critical engineer to approach his problem with a high degree of accuracy.

Instead of its title The Aluminum Industry, this book might more properly be termed the Science of Aluminum, for it handles every point concisely, systematically, and with a full knowledge of the subject. While some previous books tried to keep in a purely descriptive vein, the authors of this book sound a critical note at every desirable point, giving a strong personal touch to nearly every chapter so that it reads like a good work of fiction.

The first volume of the book, consisting of nine chapters which give the history of aluminum, its ores, its methods of purification, and a precise account of the electrolytic process, is beyond comparison with anything published up to this time; a revelation to the reader. No metallurgist or chemist should be content with the book on his library shelf, but should incorporate its contents in his brain, for it will certainly serve to round out his knowledge.

Passing to the second volume we find again a systematized set of twenty-three chapters, each of which covers its special subject. Especially important are Chapters IV and V by R. S. Archer, and Chapters XVI to XX, which gives all the necessary information for the practical man, the maker and user of aluminum alloys.

There are of necessity a few chapters less perfect than others, among which are Chapter VI on the melting of aluminum, Chapter VII on casting, and Chapter VIII on working. These chapters are by no means devoid of a goodly number of ideas, nor are they inferior to already published material, but they typify the case of an art described by men of science.

Such descriptions usually lack color, no matter who writes them, for scientists rarely do their own molding and casting under foundry conditions, and rarely handle the rolling mills themselves. If they do, it is for a matter of a few hours, not of many years, as is the case with the practical man. But unhappily the practical man has little capacity for scientific thinking and for clearly describing his own experiences. So, while a man seriously studying other chapters of the book will find himself an expert on a number of problems, in the matter of practical work he will be compelled to serve in a foundry or a mill for some time before he can acquire, or even pretend to have acquired real experience.

However, the only real criticism can be applied to Chapter III dealing with the constitution and structure of aluminum alloy systems. In a book of eight hundred sixty pages the sixty pages given to this subject seem rather too few, a circumstance which is not mitigated by the fact that a literature index covering one hundred fifty-eight items is included. How can a student of aluminum alloys residing somewhere in Alabama get hold of all items mentioned if he should need them? We believe that many more diagrams of binary and ternary alloys should have been added, particularly since a great deal of attention has been shown to the diagrams of aluminum-iron-silicon, aluminum-copper-silicon, and aluminum-copper-iron-silicon.

This chapter does not contain enough photomicrographs and does not allow the student to obtain a clear view of the continuous change in structure with the changes in concentration. For the most important systems of aluminum-silicon, aluminum-copper, and aluminum-magnesium there is included only an inadequate number of micrographs. This is most unfortunate when we realize how many extremely interesting photographs must have by now been accumulated in the files of the Aluminum Company of America.

In conclusion, I will state that, in general, this book forms the most remarkable metallurgical treatise of our times, and its price of twelve dollars is exceptionally low for the amount of information which it offers.

Die Casting Practice by Marc Stern. Published by McGraw-Hill Book Company. Size 5½ x 8; 270 pages. Price $2.50.

Here is a book for which the industry has long been waiting. It is the first comprehensive work on die castings ever published. Coming as it does from one with long years of experience and in a position of authority, it is doubly welcome.

The book covers the subject from all angles, historical, mechanical and metallurgical. The author has traced the development of die casting machines from the earliest form of type-casting mechanisms to the modern goose-neck or plunger machine. He discusses the design of die castings, their applications in industry, the design of dies, construction of dies and their materials, die casting alloys, production phases of die castings, methods of finishing die castings and alloying practice and control, including methods of analysis of zinc, aluminum, tin and lead base alloys.

The book is concisely and simply written, (profusely illustrated) at the same time covering the subject as nothing has before. It should be in the library of every die casting man.

Bearing Metals and Bearings by W. M. Corse. Published by Chemical Catalog Company. Size 6 x 9; 383 pages. Price $7.00.

This book is listed as Monograph 53 of the American Chemical Society. It covers concisely the history of bearing metals, their properties, the types suitable for different uses, bearing design, methods of testing, lubrication, and bearing troubles and failures.

The bulk of the book consists of a bibliography and abstracts of selected papers; also quantitative data on the properties of bearing metals. It is undoubtedly the most comprehensive and up-to-date summary of the bearing metal situation today.

Government Publications

Seamless Brass Pipe. Federal Specifications Board, Washington, D. C. Proposed revision of federal specification for seamless brass pipe in iron pipe sizes, standard and extra strong. Free on request to board.

The Marketing of Nickel. Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. Trade Information Bulletin No. 685. 10 cents.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Questions and Answers

To give a satisfactory answer to a question requires considerable time and careful consideration. The same applies to the making of an analysis of a solution and suggesting corrections.

If those submitting questions will describe fully their trouble, or explain in detail what they wish, it will greatly assist our expert in solving the problem. When any particular finish is desired, send a sample if possible. If impossible, refer to some particular shade of color desired and state the composition of the base metal.

When sending a sample of solution for analysis, be sure to take a correct sample, for one that is not correct is of no use at all. In fact, it will give a wrong analysis of the solution and cause incorrect suggestions to be made. When taking a sample of the solution, adjust the solution to the proper level by the addition of water. Stir solution thoroughly and then take a two- or three-ounce bottle for sample. Label and place sender's name and address on the label. This is necessary for identification. The bottle should be properly corked.

A GLASS STOPPER MUST BE USED WHEN SENDING A CHROMIUM SOLUTION.

The bottle must be sealed and packed properly to prevent breakage in transit. A convenient container for mailing is a mailing tube, which may be purchased at any local post office. A letter should be sent stating the volume of solution; temperature and current density at which the solution is operated; the original formula of the solution, if possible; class of work being plated; and what defect is produced in the deposit.

It is our desire to help solve our readers' problems. By fully co-operating with us, inquirers will place us in a better position to give answers that will prove most satisfactory.

Books on Plating

Q.—Please advise us if you have any books that would be suitable for a manufacturer of jewelry to use to get the formulae on refinishing 10 and 14 karat jewelry. We are not interested in chromium, nickel or other finishes. We want to get the different colored finishes that can be used on 10 and 14 karat gold jewelry.

A.—There is no complete treatise published pertaining to gold plating and coloring of the various shades or colors that may be produced by the combination of gold and other metals. From time to time articles have appeared in THE METAL INDUSTRY which might be of help to you.

Several of the books on plating that are for sale by this journal have a chapter or so devoted to gold plating and we believe the best are "Electrodeposition of Metals," by Langbein, and "Principles of Electroplating and Electroforming," by Blum and Hogaboom.—O. J. S., Problem 3,982.

Brightening Castings

Q.—Please give us any data you have on dipping red brass castings with the idea of getting a bright surface on the skin of the casting.

A. We suggest that you water-tumble your castings with a lot of slag, such as skimmings from the crucible or sweepings from around the chipping room. Pack them in so they will not nick.

Then dip in aqua fortis to which one ounce of Scotch or German soot has been added per gallon of solution. The acid is supposed to be kept cool by this soot. Whether it is or not, it is quite extensively used in acid dipping.

Rinse in running water tank, then dip in regular bright acid dip consisting of sulphuric and nitric acid to which a handful of salt is added. Rinse in running water, then dip in hot water and swing castings strung on a wire to dry. Dump in sawdust to take up any moisture there may be in the castings.—W. J. R. Problem, 3,983.

Bronze Powder on Wax

Q.—We will appreciate very much some information on two following questions:

What is the solvent for casein?

In copper plating a wax mold, graphite is used to metallize the wax surface in order to make the non-metallic wax conductive. I desire to use bronze or copper bronze powder for this purpose instead of graphite. The difficulty I am up against is that the copper bronze powder washes off of the wax surface. How can I apply it to the wax surface and plate copper over it before it washes off in the copper plating solution?

A.—Casein is soluble in cold water. It dissolves more rapidly in weak solutions of borax or caustic soda.

To coat wax molds for copper deposits by the use of metal instead of graphite, bronze powders are used. These should be of the finest quality, known in the printing industry as gold, bronze or copper powders. Any printers' supply house can furnish them. For your purpose, the copper ink powder should be used because of its greater conductive power and because it is not subject to attack by the copper sulphate solution.

To metallize the mold, simply substitute the metal powder for the graphite; but greater care must be taken in brushing and polishing the mold in order that the bronze powder be thoroughly bedded into the wax. This will prevent your present trouble of it being washed off in spots before it covers over the entire surface.

—W. F., Problem 3984.

Chromium Solution

Q.—Am sending a sample of chromium solution for analysis. For about 14 months this solution operated without trouble. Recently we added 100 pounds of chromic acid to it and since then it has not been able to develop enough throwing power to cover the products we wish to plate.

Can you let us know what the matter is?

A.—Analysis of Chromium solution:

Chromic acid	60.38 oz.
Trivalent chromium	6.25 oz.
Sulphates	.38 oz.
Metallic iron	5.40 oz.

Analysis shows the solution to be in a very poor condition. The trivalent and iron contents are very high. You can reduce the trivalent content by using the porous cup method. There is no way to reduce the iron content. We suggest that you discard the solution and make a new one.

O. J. S., Problem 3,985.

Gold Bronze on Steel

Q.—Please give us some information as to materials and equipment needed to secure the finish of the attached sample. We are making some shade fixtures of bright steel which we have been spraying with Duco and which we want to finish as the attached sample. Our product is about ¾ x 11 inches of about the same steel as the sample. We want to get away from spraying, if possible.

A.—The sample sent us is a steel curtain support finished in gold bronze lacquer. The materials required to produce this finish are a combination cotton and gum lacquer, a good quality of gold bronze powder to mix with the lacquer, a spray booth to confine the spread of the lacquer while being sprayed and a spray gun.

These are essential as this finish cannot be satisfactorily produced by dipping, due to the lacquer setting too rapidly to allow it to flow smoothly. The spray will give a more even spread of lacquer with less waste of material.

Two or three trials will determine the amount of gold bronze powder to mix with a given amount of lacquer to produce a satisfactory job, or the lacquer supply house will furnish a suitable lacquer already mixed for use.

For names of dealers of materials and equipment consult the Buyers Guide of THE METAL INDUSTRY.—W. F., Problem 3,986.

Molding Sand

Q.—We have been advised by a customer to use French sand for a fine finish in aluminum castings. We are at present casting in No. OO Albany sand and desire to know if in your opinion we would improve the finish with the French sand. What results can we expect from casting brass patterns in French sand? As we understand it, the initial cost of French sand is greatly in excess of Albany sand. We are told French sand has a higher fusing point and it would not be necessary to replenish our heats as often.

A.—We would not advise using French sand for aluminum castings to improve the finish. No. OO Albany should be quite satisfactory for green sand molding of aluminum castings. If a finer finish is desired, we suggest 50 per cent of "Windsor Lox" sand and 50 per cent of No. OO Albany. "Windsor Lox" sand comes from Windsor Lock, Conn. It is a very fine sand of a red color. It is rather weak, however, and will not be open enough for the whole mold unless the mold is dried. Nearly all the manufacturers in the east who make fine brass castings use "Windsor Lox" for facing the mold. With it the expense is lessened and the desired results obtained.

"Windsor Lox" sand is used for making fine ornamental castings, such as lamps and chandelier work, that are cast in green sand and the mold skin dried. "Windsor Lox" sand is fine but does not have the full plastic, adhesive nature of Albany sand. The mold must be well vented to take off the gases that are generated during the pouring.

The value of "Windsor Lox" sand lies in the fact that while it is fine it does not contain so much clay as to stop the pores and prevent the gases from penetrating it. In addition, it seems to have the property of resisting the heat of the metal without fluxing, and a fine clean surface is given the metal. The sand seems to result from the decomposition of the red sandstone of the Connecticut Valley, which is the principal rock of that locality.

French sand will make fine brass castings also, but must be milled and used about 50 per cent of French with 50 per cent Albany. It has, as you point out, a higher fusing point. The mold must be dried, however, to get the results you require.

W. J. R., Problem 3,987.

Removing Fire Stain from White Gold

Q.—I am sending you a piece of white gold-filled mesh, just as it comes from the bench. This has been soldered with silver solder, and I have had considerable trouble removing fire stain. Have tried several pickles, both strong and weak solutions of sulphuric, nitric, and combinations of both.

Can you suggest anything I can use to make this type of mesh clean and white after soldering? I do not want to use an electric strip.

A.—Removing fire stains from low karat white gold articles is more difficult than performing the same operations on the same karat of red or yellow golds, due to the greater solubility of some of the alloys used in the manufacture of white gold. For your purpose, boil the work in a solution made as follows:

Sulphuric acid	8 oz.
Bichromate of soda	3 oz.
Water	1 gal.

If this treatment does not fully remove the fire stain, suspend the parts in the following solution:

Potassium perrocyanide	1 lb.
Potassium cyanide	1 lb.
Glacial phosphoric acid	2 sticks
Water	8 gal.

Boil the chemicals until dissolved, allow the solution to cool; use cold; 6 to 8 volts, reverse current; lead or steel anodes. Keep work in motion.

W. F., Problem 3,988.

Swedish Iron

Q.—We have been receiving inquiries for a Swedish Iron finish on andirons and ornamental iron work. We would like to know exactly how it is done.

A.—Swedish iron finish is produced by coating the iron with flat black lacquer; either air dry or bake at 100° to 110° F.

Rub down for relieving with wet sand, pumice stone or emery to bring out the design or figure. Finish with a coat of clear lacquer to prevent rusting of relieved surfaces.

W. F., Problem 3,989.

White Brass

Q.—I saw a mixture in your April issue called "White Brass," a mixture similar to one we experimented with, and our trouble was that after the metal was poured into the molds and about set or solidification took place, the metal would rise in the heads of risers, causing the castings to be spongy or full of blow holes, caused, no doubt, by gas in the metal. In the mixture we used there was a small amount of tin. I am under the impression that where nickel is used in any bronze or white brass, you must add a certain amount of silicon, manganese or magnesium, to drive the gases out of the metal. If that is not the cause, what forces the metal to rise in the heads or risers after the metal is cast? What I would like to know is what to add in a mixture like Monel metal or nickel-bronze to drive the gases out and get a solid casting and when it is added to the metal.

A.—The whole problem of melting and pouring metal containing nickel is to melt quickly and not to let the metal stand in the furnace when ready to pour, as this metal takes up gases quickly. When the metal rises in the head of the sprue, it is positive evidence that the metal has been gassed and a deoxidizer is desirable when making such alloys. Deoxidizers are used as follows: 15% manganese copper: 3 ounces to 100 pounds of metal; or use aluminum where pressure castings are not required. Magnesium: 3 ounces per 100 pounds of metal. Manganese copper and magnesium may be used together.

It is advisable to test such metal before pouring. Take a sprue cutter—2½ inch brass pipe—and press down in the sand about 3 inches and pour this piece in an open mold. If the metal is deoxidized it will shrink down; if not, it will rise up in the mold and in this latter case more deoxidizer is required.

However, under good melting practice very little deoxidizer is required other than the amount given above.

W. J. R., Problem 3,990.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,745,912. February 4, 1930. **Chromium-Coated Wire and Method of Manufacture.** Henry Kneeland Richardson, Bloomfield, N. J., assignor to Westinghouse Lamp Company, a Corporation of Pennsylvania.

The metal of coating a metal with chromium comprising cleaning the same as a cathode in a caustic solution, then as an anode in an acid solution, and then electroplating with chromium.

1,746,987. February 11, 1930. **Protection of Cuprous Metals.** Irving T. Bennett, Brooklyn, N. Y., assignor to Thomas E. Murray, Brooklyn, N. Y.; Joseph Bradley Murray, Thomas E. Murray, Jr., and John F. Murray executors of said Thomas E. Murray, deceased.

The herein described product adapted to resist corrosion at high temperatures and to resist acids comprising a base of cuprous metal coated with protective layers, the first containing iron, the second containing chromium and the third containing nickel.

1,747,131. February 11, 1930. **Dust Arrester.** Seely Sherwood Parsons, Cleveland, Ohio, assignor to The New Haven Sand Blast Company, New Haven, Conn., a corporation of Connecticut.

In a dust arrester, a battery of filter bags, vertically adjustable suspension means for each of said bags by which the several bags may be hung at uniform tension in spite of variation in bag lengths.

1,747,197. February 18, 1930. **Process for the Production of Aluminum-Silicon Alloys Free from Carbide.** Conway von Girsewald, Frankfort-on-the-Main, Germany.

A process for the production of practically carbide-free aluminum-silicon alloys by electro-thermic means, which comprises the production of a practically iron-free preliminary alloy containing upwards of 35% of silicon and alloying said preliminary alloy with pure aluminum.

1,747,704. February 18, 1930. **Method of and Apparatus for Silvering Glass Knobs.** George Glaudel, Redondo Beach, Cal., assignor of twenty per cent to Herman Miller, South Pasadena, Cal.

The method of silvering knobs, which comprises placing a plurality of knobs in a tray with the ends requiring silvering extending through closely fitting apertures in the botom of the tray and against a moistened felt guide.

1,747,776. February 18, 1930. **Production of Dark Oxidic Coatings on Magnesium and Magnesium Alloys.** Bohumil Jirotka, Berlin, Germany, assignor to the Firm Dr. Otto Sprenger Patenverwertung Jirotka m. b. H., Vaduz, Liechtenstein.

The process of producing dark oxidic coatings on magnesium and magnesium alloys, which consists in treating the said metals in neutral baths, which contain water-soluble salts of manganese and water-soluble salts of the chromic acid.

1,747,796. February 18, 1930. **Incorrodible Aluminum Alloy.** Hans Schorn, Lausitz, Germany.

A sea-water-corrosion-proof alloy containing aluminum as its main ingredient, 1 to 6 per cent of magnesium together with 0.05 to 1 per cent of titanium.

1,748,037. February 18, 1930. **Bearing.** Edgar J. Leach, Janesville, Wis., assignor to Ackermite Company, Janesville, Wis., a Corporation of Delaware.

A bearing comprising an integral body of a matrix of copper having lead embedded therein, and a thin, smooth wear resisting inner surface of lead.

1,748,363. February 25, 1930. **Metal Plating.** Charles L. Pierce, Jr., Pittsburgh, Pa.

In an apparatus for coating articles, a rotary spindle having circular engaging faces and a frame for securely holding a plurality of articles to be coated and adapted to be rotated by said spindle.

1,748,494. February 25, 1930. **Pickling and Cleaning of Metals.** Paul I. Murrill, South Norwalk, Conn., assignor to R. T. Vanderbilt Company, Incorporated, New York, N. Y.

A cleaning or pickling bath prepared by adding to a suitable acid solution a small amount of a compound having the general formula

$$\begin{matrix} RN—C_nH_{2n}—NR \\ | \qquad\qquad | \\ X \qquad\qquad X \end{matrix}$$

in which X is an acid radical and R N indicates a nitrogenous heterocyclic base or derivative thereof.

1,749,443. March 4, 1930. **Electrodeposition of Chromium.** Charles Henry Proctor, Arlington, N. J., assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y.

As a new composition, a chromic acid electroplating solution containing, for each gallon of water, the following ingredients in about the proportions given:

	Ounces
Chromic acid (CrO_3)	8 to 48
Chrome-iron ore (commercial)	¼ to 1½
Sulfuric acid	1/12 to ½

the chrome-iron having essentially the following analysis:

	By weight per cent
Chrome oxide (Cr_2O_3)	48-50
Iron Oxide (Fe_2O_3)	20-25
Silicon oxide (SiO_2)	7- 7
Magnesium oxide (MgO)	12-14
Aluminum oxide (Al_2O_3)	7-10

1,749,474. March 4, 1930. **Balloon Envelope.** Junius D. Edwards, Oakmont, Pa., assignor to Aluminum Company of America, Pittsburgh, Pa.

A gas-retaining balloon-envelope made of fabric bearing a gas-retaining coating composed of rubber having flake-like metallic particles distributed throughout a substantial portion of its thickness.

1,749,541. March 4, 1930. **Compound for Filling Recesses in Metal Castings and the Like.** Zacheus M. Marr, Fremont, Nebr.

A luting composition consisting of such a mixture of sulphur, graphite and antimony as to produce a filler having a comparatively high melting point and degree of hardness and capable of use when melted as a filler for castings.

1,749,952-3; 1,750,807-8. March 11, 1930. **Hanger for Articles to be Plated.** Louis Lichtman, New York, N. Y., assignor to Chromeplate, Inc., New York, N. Y., a Corporation of New Jersey.

In a hanger for supporting flexible articles of interlinked units, a substantially rectangular frame having hangers at its top and article supports, each including a pair of hooks, the members in substantial register and secured to opposite members of the frame, and springs interposed between the hooks and the frame.

1,750,092. March 11, 1930. **Electroplating Process.** Robert Brace Penn, Crawford, Chicago, Ill., and Roy Dietrich Snyder, Hazelton, Pa.

An electrolyte for electrodepositing an alloy of copper and nickel, which comprises nickel ammonium sulfate, copper oxalate, boric acid, nickel chloride, ammonium hydroxide, and water.

1,750,270. March 11, 1930. **Coated Iron and Steel Articles and Method of Making the Same.** Elmer M. Jones, Detroit, Mich., assignor to Parker Rust-Proof Company, Detroit, Mich., a Corporation of Michigan.

Iron or steel articles, or articles having surfaces of iron or steel, having a coating formed in situ on said surfaces and comprising a silicate of iron and a phosphate.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Solution Control Apparatus

The Pitschner electrometric apparatus for the control of nickel plating solutions has been placed on the market by Eimer & Amend, Third avenue, 18th to 19th streets, New York, N. Y.

Directions for Setting Up

The set up is shown in the illustration.

1. Thoroughly clean all glass parts and connecting tubes. Rinse out the calomel cell with a little of the potassium chloride solution.
2. Fill contact (side) tube at the bottom of part "a" of the calomel cell with ordinary mercury to within one inch of top, making certain that the mercury contacts with the platinum wire.
3. Clamp part "a" of the calomel cell to the ring stand.
4. Pour a sufficient quantity of the specially prepared mercury into part "a" of the calomel cell so that mercury is at least ¼ inch above the platinum wire.
5. Add a ⅜ inch layer of specially prepared calomel previously moistened with potassium chloride solution, to the calomel cell.
6. Suspend part "c" of the calomel cell on the ring.
7. Insert part "b" of the calomel cell through one hole of the two hole rubber stopper and connect by means of rubber tubing to parts "a" and "c." This part "b" has alundum disc fused in at the bottom to allow slow but continuous washing by potassium chloride.
8. Fill the tube of indicator electrode with mercury to within one inch of top and insert it into the second hole of the rubber stopper.
9. Fill part "c" with saturated potassium chloride solution previously saturated with calomel.

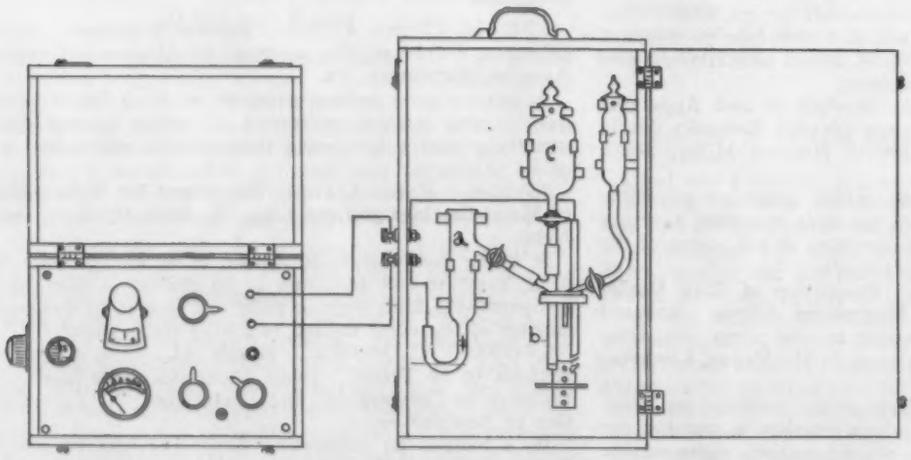


Diagram Showing Layout of Pitschner Electrometric Apparatus for Control of Nickel Plating Solutions

10. Open the stopcocks of the calomel cell allowing the potassium chloride solution to run to the bottom of the salt bridge, i.e., to the alundum disc, and up through the side tube of the part "a" until the cell is filled slightly above the side tube.

Note: Be sure to eliminate all possible air bubbles from part "b" and side tube of part "a."

11. Insert one end of one of the flexible leads into the mercury of the indicator electrode and one end of the other lead to the reference electrode connecting the other ends of the leads to the binding posts of the Electrometer.
12. Release the galvanometer needle. Adjust this needle and the needle of the factor meter, if necessary, exactly to zero. The adjustment is made by means of the small screws outside the glass.
13. Fill the drop burette with sulfuric acid solution made up by diluting one part of the sulfuric acid used for bath additions to exactly ten times its original volume.

The apparatus is now completely assembled. The calomel cell, if properly cared for, should remain accurate for months.

PROCEDURE IN DETERMINING pH BY THE QUINHYDRONE ELECTRODE

The procedure is extremely simple. About 50 cc. of the solution to be tested is saturated with quinhydrone measured out on the tip of a knife blade or spatula. A little of this solution is used to rinse off the two electrodes. The electrodes are then immersed in the solution and the E. M. F. between them is read by means of the potentiometer, as described below. After the determination, the electrode tips are rinsed with distilled water.

Reading of the Potentiometer

1. Pull out the battery switch and by means of rheostats set the needle of factor meter to correspond exactly with 1.
2. Turn the potentiometer knob until the galvanometer needle comes to rest at zero. If it is impossible to obtain this condition, give the polarity switch a quarter turn and again turn the potentiometer knob until the galvanometer balances. If it is still impossible to obtain this condition, set the needle of the factor meter by means of rheostats to correspond with 2 and turn the potentiometer knob until the galvanometer balances.
3. Read the potentiometer scale and multiply by the factor meter reading to obtain the E. M. F. in millivolts. Measurements with the quinhydrone electrode usually fall within the range of Factor 1 where the potentiometer scale reads millivolts directly without the use of a factor. The user will note that the function of the potentiometer is to divide the selected range into 250 divisions. These may be subdivided further by eye if a closer reading is desired.
4. The voltage reading is then converted to pH units by means of the proper table showing relation of E. M. F. to pH. This is supplied with the instrument. The accuracy obtainable by this means depends on the care with which the factor meter needle was set, and should be within .07pH. It is recommended that the battery E. M. F. setting be standardized for pH measurements as described in the next paragraph.

Standardization of Battery E. M. F.

In order to obtain the greatest accuracy in pH measurements, the battery E. M. F. should be standardized by means of a buffer of known pH value. M/20 potassium hydrogen phthalate is recommended for this purpose because of the purity and absence of moisture in the salt as well as the ease with which a solution of definite pH value can be made up. This solution has a pH value 3.97 to 3.98. It is prepared by dissolving 10.209 grams of the

salt in distilled water and making up to exactly one liter in a volumetric flask at room temperature.

In the pH tables which accompany the instrument, it will be found that a solution of 3.97 to 3.98 pH will produce the following E. M. F.'s, when a saturated calomel electrode is used as reference:

TEMPERATURE	QUINHYDRONE ELECTRODE
20° C.	.222
25° C.	.218
30° C.	.214

Assume, for example, that pH measurements are to be made with the quinhydrone electrode at 25° C. The corresponding voltage, as shown above, is .218. The standardization is carried out as follows:

1. Set the potentiometer scale to the voltage corresponding to the pH of the solution, in this case, .218.
2. Immerse the electrodes in M/20 potassium hydrogen phthalate solution saturated with quinhydrone exactly as if the pH of the solution were to be measured.
3. Adjust the battery E. M. F. until the galvanometer needle is at zero, without regard to the factor meter. The needle of the factor meter will fall exactly on the mark 1.
4. Do not touch the battery rheostats in subsequent measurements, except for restandardizing. For accurate results, standardize daily.

Determination of Amount of Acid to Be Added

A simple method for determining the amount of sulfuric acid necessary to bring the pH of nickel plating solutions to the desired value is as follows: 100 cc. of the plating solution is pipetted out and sufficient quinhydrone added to saturate it. The salt bridge of the calomel electrode and the platinum indicator electrode are immersed in the sample and the potentiometer adjusted to read the pH. The standard acid is then added drop by drop, the drops being counted. The potentiometer is balanced after each addition. The sulfuric acid is added until the millivolt reading of the potentiometer corresponds to the pH value desired for the nickel solution. From the number of drops used, the required addition to the bath is calculated. One drop of the 10% acid corresponding to $\frac{.0406}{10 \times 100}$ or .0000406 gal. of concentrated acid per gallon of plating bath.

Frequently, it is found convenient to measure out the acid to be added with a graduate marked in cubic centimeters. In this case, one drop corresponds to .16 cc. per gallon of solution. Thus, if the pH of 100 cc. sample from a 1,000 gallon nickel plating bath requires 20 drops of 10% acid to change the pH from 6.2 to 5.5, the acid required for this change in the bath will be .16 x 20 x 1,000= 3,200 cc. of concenrtated acid.

New Silicon Bronze

A new silicon bronze is being made by the Bridgeport Brass Company of Bridgeport, Conn. Starting with a strength of approximately 42,000 lbs. per sq. in. in the annealed condition, it develops a strength of approximately 130,000 lbs. per sq. in. when severely cold drawn. Cold drawing, however, does not make it brittle such as is characteristic of hard worked brass and nickel silver.

Duronze rod, which has a tensile strength of approximately 100,000 lbs. per sq. in., can be readily upset and roll threaded in the manufacture of cap and machine screws. Heads formed by this cold upsetting process are not weak and brittle. Duronze can also be hot worked or hot forged. It resists corrosion better than brass or copper, standing up remarkably well in dilute sulphuric and dilute hydrofluoric acids. Although it is not designed as an acid resisting material, it stands up as well and often better than many expensive so-called acid resisting alloys.

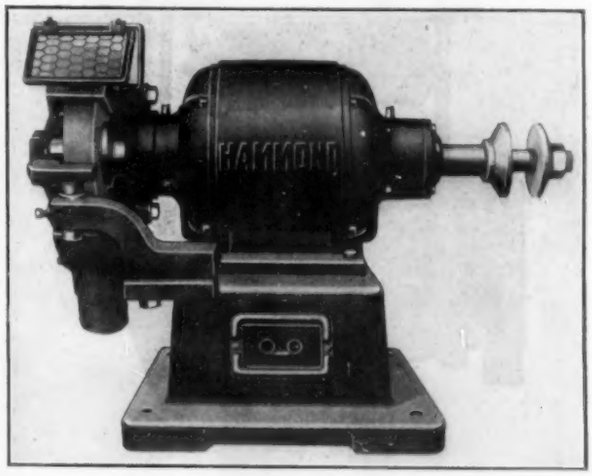
Its immunity to season cracking makes it very desirable for use in outdoor construction work where weathering and sudden changes in temperature destroy the usefulness of brass bolts. Duronze does not crack under the action of ammonia gases which seriously injure brass and nickel silver. It does not become brittle when immersed in mercurous nitrate solution, which completely amalgamates with brass and causes it to become fragile.

Duronze is available in sheet, strip, rod and wire and, the company states, should be specified where a metal that must possess great strength, malleability and toughness and resistance to chemical and atmospheric corrosion and immunity from season cracking is desired.

Combination Grinder and Buffer

The illustration shows the No. 171A Hammond Type LW combination grinder and buffer, which is made in ½, 1½ and 2 h.p. sizes.

This is said to be an excellent general purpose tool, as the grinding wheel can be mounted on the one side with buffing, polishing or wire scratch wheel on the opposite end.



New Buffing and Grinding Machine

The motor is especially designed for this service, capable of withstanding excessive overload and built in accordance with the N. E. M. A., recommendations. The 1½ h.p. and larger machines are equipped with push button control and Cutler-Hammer Automatic Motor Starter, which protects the motor from overload, low voltage and phase failure.

These machines are furnished for alternating current in 110, 220, 440 and 550 volt, 25 to 60 cycle, 1, 2 or 3 phase. Direct current, 110 and 220 volt.

Improved Sandblast Equipment

The New Haven Sand Blast Company of New Haven, Conn., in its exhibit at the recent Foundry Convention in Cleveland, showed some interesting features in the construction of its sandblast equipment.

A sandblast room is made with special "wearing plates" on the sides, which are not bolted but slipped into place, where they are held in grooves or slots. This feature adds considerably to the life of the room and decreases the cost of upkeep.

Another improvement has been incorporated in their mechanical elevating system in which a cone conveyor is used to move the sand from the floor hopper to the bucket conveyor, replacing the old type of screw conveyor. The wear on the cone conveyor is comparatively light and the delivery to the bucket conveyor is altogether adequate.

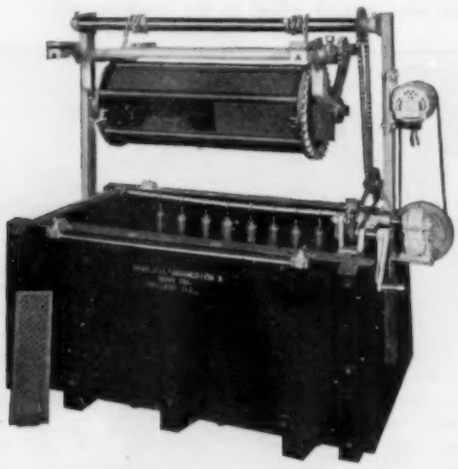
New Black Lacquer

A new gloss black lacquer for one-coat application has been placed on the market by the Agate Lacquer Manufacturing Company, 11 Forty-third Road, Long Island City, New York. The makers state this lacquer has an extremely high lustre and that the coating it produces is very hard. The applications of this lacquer include coating of iron, steel and non-ferrous metals, wood and other substances.

New Plating Barrel

Charles F. L'Hommedieu and Sons Company, 4521 Ogden Ave., Chicago, Ill., have developed a new horizontal plating barrel called the Reliance.

The cylinders are made of Fibroc (canvas base bakelite) in lengths of 24", 30", 36" and 42"; all 12" diameter. Contact with the work is made by a steel dangler projected a short distance from each end of the cylinder, which swings on a copper support rod. These contacts are easily removed for cleaning by simply unscrewing a Fibroc nut which holds them in place. They are the only metal parts inside the cylinder. The door of the cylinder is in two parts which slide out at each end.



New Type Plating Barrel

The supporting shafts at each end of the cylinder rotate in a rigid cast iron frame, which rests on four wedge-shaped blocks on the sides of the tank. The blocks on one side are of copper and connect with negative generator terminal. Heavy, thoroughly insulated copper wires carry the current from these blocks which are part of the cylinder frame to the contacts in the cylinder. The current travels less than half the length of the cylinder to reach all the work.

The work is easily raised and lowered. The supporting frame drops into place without being guided by hand.

The gear on the cylinder frame meshes readily with the driving gear while the latter is rotating. Electrical contact and rotation are both established the instant the cylinder is in place. There is no danger of burning the work because of delay in rotating the cylinder.

Tank is of 3" fir, width 28", depth 24", length for 36" cylinder, 50" length for other sizes varies with length of cylinder.

Capacity of 12 x 36" cylinder about 3 pecks.

Overall dimensions 71" x 40".

Number of anodes required, 16.

Perforations in cylinder, ⅛" to ½".

Maximum load, 275 lbs.

Shipping weight, approximately 1,000 lbs.

Furnished, motor drive or belt drive; ½ hp. required.

Motor drive has two speeds: 4 and 8 r. p. m.; speed can be changed instantly by shifting V-belt from one set of pulleys to the other.

Driving mechanism and lifting mechanism are on same end of tank, saving floor space and the operator's time.

"Silveroid" New Metal Product

A new metal product known as Silveroid is apparently meeting with considerable favor in England. This metal is an alloy of copper (54 per cent), nickel (45 per cent), and manganese (1 per cent). It derives its name from the fact that the finished product closely resembles silver and silver plate.

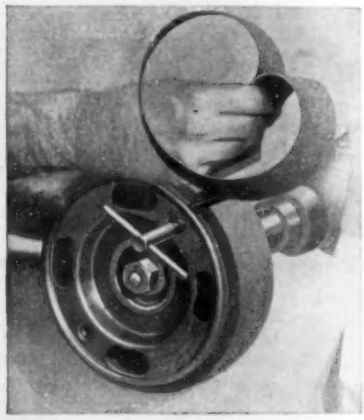
It is claimed that the metal is white throughout and therefore does not change in appearance through wear, that it does not tarnish, and as ordinarily used requires no cleaning or polishing. Chief products at present manufactured and placed on sale include tea sets, ash trays, and similar articles which are ordinarily nickel-plated or silver-plated. It is also said that it makes a very successful base for silver-plate, although its high cost, its products being only slightly cheaper than silver-plated ware, makes this factor of small advantage. It is also claimed that it is two and a half times stronger than ordinary nickel-plated ware and therefore much more durable.—Foreign Trade Notes.

New Buffing Wheel

Buffing operations are being speeded up and buffing costs impressively reduced with the new Quick-As-Wink buffing system, according to the statement of C. B. Hunt & Son, Salem, Ohio, the makers.

Quick-As-Wink Cushion abrasive wheels are made in 6, 8 and 12 inch diameters and they give a clean smooth buffing action the full width of the face of the wheel on either stationary or flexible shaft buffers.

Abrasive cloth of any grade, from 24 to 180 grain, can be used and the application of new band is done easily without removing wheel from spindle. Strips of abrasive cloth may be attached with or without metal end clips. A slight turn of the wrench tightens strip on wheel and revolving of wheel causes a slight expansion of the rubber cushion so abrasive cloth hugs entire surface tightly. This makes slipping of cloth impossible at any speed or pressure.



Cushion Abrasive Wheels for Buffing

The method of applying abrasive cloth and the strength of construction permit safe operation at high speeds. Before shipment, each wheel is tested at speeds up to 8,000 r.p.m. although speeds ranging from 3,500 to 5,000 are recommended as most efficient.

The Hunt Company furnish abrasive cloth strips to users, either with or without the metal clips and a combination cutter and clipper capable of turning out 300 bands per hour has been built and furnished to large users.

New Aluminum Alloy

A new aluminum alloy has been developed by Messrs. Hall and Bradbury in the laboratories of Rolls Royce, Limited of England which has been patented and is being marketed under the named "R.R.50" The chemical composition is as follows:

Copper—0.5 to 5.0%
Nickel—0.2 to 1.5%
Magnesium—0.1 to 5.0%
Iron—0.6 to 1.5%
Titanium—Up to 0.5%
Silicon—0.2 to 5.0%
Aluminum—Remainder.

The advantage claimed for this type of alloy is the ease of making dense, sound castings, as sure as with the modified aluminum silicon alloys. Moreover the "R.R. 50" alloys can be heat treated at about 175 deg. C and aged, giving very high tensile strength and toughness.

New Overhanging Type Lathe

A bit of news for plants with polishing and plating departments, is the announcement by the Crown Rheostat and Supply Company, Chicago, of their new direct drive overhanging type lathe.

It is built with an overhanging spindle which is brought forward 10 inches from the normal position, as shown in the illustration. This brings the spindle 4 inches in front of the face of the stand, which permits a much greater working radius in handling long and curved pieces.

Buffing and Polishing Lathe With Overhanging Spindle

The frame is of heavy and rigid one-piece construction. The motor is snugly mounted in an out of the way position in the rear—at an angle to give a direct "spiral" gear drive with the maximum driving efficiency of 97½%. The efficiency of Crown "spiral" gear drive has been tested and charted at this figure (bearing losses not deducted). However, bearing losses can be set at a very negligible figure as both motor and lathe spindle are ball bearing.

The machine is noiseless and without vibration—the two vital factors in getting maximum production. The driving gear, on the motor, is of exceptionally high quality hardened steel, accurately cut and true to pitch at all points. The driven gear on the lathe spindle, is of special phosphor bronze. The use of a driving steel gear and phosphor bronze driven gear is the accepted, correct combination.

Combination Coke and Oil Melting Furnace

A furnace which can be changed from one fuel to another has been designed by the Monarch Engineering and Manufacturing Company of Baltimore, Maryland. This furnace burns either coke or coal and has been recommended very highly for territories where they have only wood, coal or charcoal. The later acquisition of oil or gas will permit this furnace to be used in combination with the burner for oil or gas.

For instance, in use of coke, the oil burner starts off the fire and adds to the heat. Afterward the burner can be shut off and coke used. Then in case the furnace is to be used regularly with oil or gas, simply brick over the bottom grate bars, and the furnace, instead of using a 150 lb. pot can use a 275 lb. crucible. It is good for brass red or yellow, copper, bronze, aluminum, iron, etc.

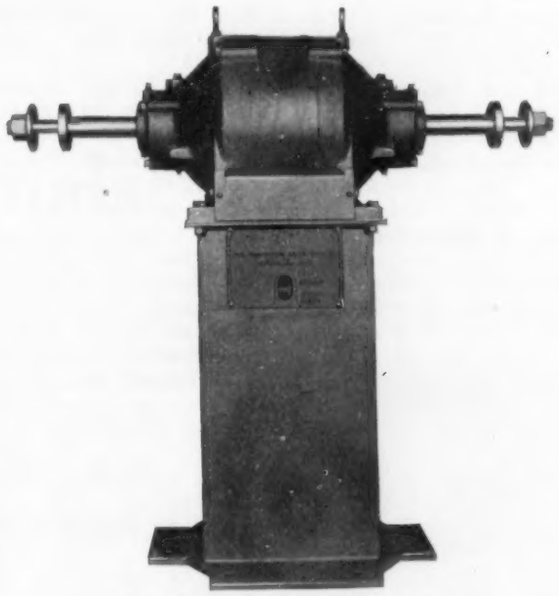
New Light Alloy of High Strength

A new alloy of light weight for which some highly desirable advantages are claimed by its developers, has been announced by the Drekolias International Corporation, 130 West 42nd Street, New York City, of which Dr. John E. Jackson, 72 Washington Street, New York City, is technical head. The company's announcement states that the alloy, composed of aluminum, zirconium, copper, iron and tin, was first discovered after much research by a German chemist, and further developed by Dr. Jackson in this country, whom the Drekolias firm interested in the metal. It is stated that the alloy has been put in use in the "Autofloat," a device for preventing ships from sinking although wrecked, and by manufacturers of aircraft. The alloy is stated to have a tensile strength of 71,000 pounds and a Brinell hardness of 112; specific gravity is 2.12, with possibility of reduction to 1.70 after further experimentation has been carried out. The alloy, furthermore, is said to have high resistance to corrosion by acids, alkalis and other corrosive substances. Electrical resistance is about the same as that of copper, it is claimed.

Grinders and Polishers

The Production Equipment Company, Cleveland, Ohio, is now manufacturing a complete line of grinders and polishing lathes, marketed under the name "One Profit," which is derived from the fact that the entire tool including motor is manufactured in their own plant.

These grinders and polishing lathes follow modern trend of design and construction. Steel replaces cast iron wherever possible. The bases are constructed from heavy steel shapes welded to form a compact and rigid support, the makers state. Fully enclosed motors, designed and built especially for grinder and buffer application, requiring no ventilation whatever and thereby eliminating dirt-carrying air from inside the most important part of the equipment, are used. Other features mentioned are: unusually large spindles of nickel steel carried in oversize ball bearings mounted in grit-proof housings; large oil reservoirs; push-button-operated automatic starter provided with overload and no voltage release assures complete motor protection; starter mounted in base; push button in cover convenient to operator.



New Grinding and Polishing Lathe

These grinders and buffers can be supplied in bench or pedestal types in sizes ranging from 1 to 15 horsepower for normal duty, heavy duty or super service requirements. Likewise the design embraces both motor in head and motor in base types. The complete classification includes multi-speed and selective speed machines; snaggers, double disc grinders, combination disc and standard grinders and combination grinder and buffer.

Catalogs describing each type, of particular value to users of such equipment as all sizes contain recommended wheel sizes, can be had upon application to the company.

Oil Regulating Valves

A new type of oil regulating valves has been developed by the Hauck Manufacturing Company, 126—10th street, Brooklyn, N. Y., called the Hauck Micro-Vernier Oil Regulating Valve. This valve is said to give firm regulation of the flow of oil, to be practically self-cleaning, to eliminate frequent clogging, particularly when using heavy oil, and to secure the same regulation of flow, day by day. A circular of the Hauck Manufacturing Company lists the ten features of their valve which accomplishes the above named improvements.

Equipment and Supply Catalogs

Silicate P's and Q's. Philadelphia Quartz Company, Philadelphia, Pa. Technical information on silicates of soda.

Norton Pulpstones. Norton Company, Worcester, Mass. Booklet on abrasive stones for making pulp and paper.

Duronze. Bridgeport Brass Company, Bridgeport, Conn. A booklet describing a silicon bronze, its applications, etc.; well illustrated.

Fynn-Weichsel Motors. Wagner Electric Corporation, 600 Plymouth Avenue, St. Louis, Mo. A 16-page bulletin (No. 171) on power engineering

Electric Furnaces. Ajax Metal Company, Electric Furnace Division, Philadelphia, Pa. Catalog No. 22, large, illustrated; gives descriptions and specifications.

Lacquers. Merrimac Chemical Company, 148 State Street, Boston, Mass. Outlines the process of lacquer manufacture, lists uses, includes color chart, etc.

Proper Ventilation. Cleveland Blow Pipe and Manufacturing Company, 6505 Cedar Avenue, Cleveland, Ohio. Leaflet on American Blower Company's products.

Buffs and Polishing Wheels. Allied Industrial Products Company, 17 North Elizabeth Street, Chicago, Ill. A new catalog of this company's products in this line.

New Brunswick, Canada. Department of Interior, Ottawa, Canada. 168-page book with map, by L. O. Thomas, giving natural resources and development of the province.

Tantalum Enters the Industrial Field. J. Bishop and Company Platinum Works, Malvern, Pa. Good information on an unusual metal; nicely printed and illustrated booklet.

National Motor Truck Analysis. General Motors Truck Company, Pontiac, Mich. Analysis of questionnaire sent to truck owners last year. Interesting information on truck use.

First Aid Service in Small Industrial Plants. Metropolitan Life Insurance Company, Policyholders Service Bureau, New York City. Also, Cooperative Marketing Activities in Business.

The Little Red Rooster and the Old Black Hen. Zeller Lacquer Manufacturing Company, 342 Madison Avenue, New York. A humorous poem, nicely printed, for hanging on the wall, on the subject of business conditions.

Metal Plating. Engineering Devices Company, 545 Fifth Avenue, New York; 200-page book describing inventions of Prof. M. Schlotter in the field of metal coating with a variety of metals, primarily by the control of special electrolytic solutions.

The Whole Story. The Lea Manufacturing Company, 16 Cherry Street, Waterbury, Conn. Interesting information on greaseless compounds for metal finishing, cutting down stainless steel, producing frosted effects on aluminum, and many other finishes.

Facts for Foundrymen. Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y. Second edition of this interesting booklet by Ernest G. Jarvis, revised by Samuel Frankel. Gives considerable data on alloys, metal mixtures and special compositions.

Dust Collecting Equipment. The Dust Recovering and Conveying Company, Cleveland, Ohio. Large illustrated catalog in a good cover, showing this company's complete line of equipment for dust and fume collecting or recovering, spray drying systems, etc.

The 92 Elements. P. C. Kullman and Company, 110 Nassau Street, New York City. Leaflet giving names, atomic numbers, symbols, atomic weights, melting points and years of discovery of all the elements. Should be useful to all founders, metal workers, platers, etc.

Portable Hardness Tester. Industrial Apparatus and Instrument Company, Newark, N. J. Folder describing device for making Brinell tests. It is shaped like a C-clamp, with the ball on one grip. Pressure is measured by a dial actuated by elastic change in the body of the clamp.

Cleaning Castings. Pangborn Corporation, Hagerstown, Md. An illustrated four-page leaflet describes the new dustless core knockout which is claimed to thoroughly remove cores, core rods and other material from all parts of a casting by hydraulic cleaning under high pressure.

Engine Design. The International Nickel Company, Inc., 67 Wall Street, New York City. Booklet on reducing transportation costs by means of engine design, an article by E. J. Hall, vice-president in charge of production and engineering of the Hall-Scott Motor Company, Berkeley, Calif.

Electrical Handbook. Electrical Association of New York, Inc., 100 East 45th Street, New York City. Covers illumination, industrial control and heating, material handling, motors, refrigeration, signals, signs, switchboards, wiring, ventilation, tools, etc. A compact, concise volume of information.

Aluminum Alloy Castings. British Aluminum Company, Ltd., New York; 24-page pamphlet describing foundry practice and the requirements for compositions standardized by Society of Automotive Engineers, British Engineering Standards Association, and for British and American naval aircraft.

The Art of Lacquering. The Egyptian Lacquer Manufacturing Company, New York City. A highly interesting booklet containing information of value to all lacquer users. It describes lacquers and lacquer enamels and outlines all data necessary for proper application. It also gives treatment of articles after lacquering or enameling.

General Electric Company, Schenectady, N. Y. Publications: Industrial Control Catalog GEA—606B 1930; 170 pages, illustrated; Nonmetallic Gears and Blanks Price List; Fabroil Gears Price List; Industrial Heating Devices, Leaflet; and the following bulletins: Synchronous Motors for Metal Rolling Mills; Drum Controllers; Hatchway Limit Switch; General-Purpose Synchronous Motors. **Catalog GEA—600A,** superseding all previous catalogs issued, except those on railway, mine and industrial supplies and merchandise; 1146 pages, 8 x 10½ inches, profusely illustrated and well indexed.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

Metal Findings Manufacturers

HEADQUARTERS, CARE OF H. R. BARKER, FULFORD MANUFACTURING COMPANY, PPOVIDENCE, R. I.

The regular June meeting of the Metal Findings Manufacturers Association was held in the Biltmore Hotel, Providence, R. I. Those present were Frederick A. Ballou of B. A. Ballou and Company, Inc.; Edgar E. Baker of W. R. Cobb Company; Ralph Gregory of Goodwin and Gregory; Frank E. Farnham of Jewelers' Supply Company; William G. Lind of T. W. Lind Company; William Whytock of Roland and Whytock; Thomas H. Wightman of A. Vester and Sons Company; William M. Simmonds of Josiah Walsham Company; and William A. H. Wells of Wells Findings Corporation. The report of the treasurer was approved.

President Farnham brought up the matter of vacation periods to ascertain if it was deemed advisable to have uniform closing of the factories of the members during the summer. There was a general discussion of the subject by those present at the meeting. From indication of the trend of opinion, the matter of uniform closing is out of the question for this year. Other matters were taken up and informally discussed but no vote was taken before adjournment.

Association of Waste Material Dealers

HEADQUARTERS, TIMES BUILDING, NEW YORK CITY

Dealers, washers and importers of wiping cloths from all sections of the United States and Canada will meet at the Congress Hotel, Chicago, on Monday and Tuesday, July 14th and 15th, for the purpose of organizing an association embracing the above-mentioned groups, which organization will operate as a division of the National Association of Waste Material Dealers, Inc. There will be general sessions throughout both days. There will also be group meetings in which dealers, washers and importers will meet separately to consider some of the problems facing the industry.

The new tariff just passed is going to bring changed conditions, and the Chicago meetings are going to furnish an opportunity for a most thorough consideration of problems and conditions which face the industry at the present time. The Organization Committee has been hard at work preparing plans to be submitted for approval at the organization meeting which, if adopted, are sure to prove of substantial value to those in the industry.

In spite of the poor business conditions now prevailing, the interest in this new organization is so great that a large attendance is already assured. Detailed information can be obtained by addressing Charles M. Haskins, secretary of the National Association of Waste Material Dealers, Inc., Times Building, New York, who is acting as secretary of the Organization Committee.

CHARLES M. HASKINS.

American Institute of Weights and Measures

HEADQUARTERS, 33 RECTOR STREET, NEW YORK

The Twenty-third National Conference on Weights and Measures was held in Washington, D. C., June 3-6. Most of the sessions were at the Bureau of Standards. A feature of the program was the inclusion of Hon. Randolph Perkins, chairman of the House Committee on Coinage, Weights and Measures. Mr. Perkins has before him the two Britten resolutions, the one calling for an investigation by Congress of the metric system, and the other establishing the three primary metric standards as the legal standards.

At the opening session of the conference, Dr. George K. Burgess, Director of the Bureau of Standards, presented his usual summary of Federal Weights and Measures legislation pending.

Personals

Inventor Honored by Franklin Institute

Heyman Rosenberg, vice-president of the Parker-Kalon Corporation of New York, was among the distinguished scientists and engineers to be honored by the Franklin Institute of Philadelphia at the Medal Meeting held by the Institute on May 21, 1930. Mr. Rosenberg was awarded the Institute's Certificate of Merit for his development of Parker-Kalon hardened self-tapping screws, which have contributed greatly to the fabrication of metal products of every description.

Heyman Rosenberg

His first achievement along these lines took the form of a self-tapping sheet metal screw that overcame the difficulties previously encountered in joining and making fastenings to light gauges of sheet metal. This unique screw was so threaded and hardened as to make it capable of cutting a thread in sheet metal.

Having produced an easier, quicker and cheaper means of making light gauge sheet metal assemblies, the inventor's thoughts turned to the problem of making fastenings to solid sections of material, such as iron, brass and aluminum castings, steel, bakelite, etc., where the tapping of holes, with its breakage of taps, upkeep of tapping machinery, etc., is often a factor in the cost of the article. Mr. Rosenberg devised and patented the screw, now generally known as a hardened metallic drive screw. This screw has a spiral form of hardened thread, which cuts or forms a corresponding female thread in the material as it is hammered in or otherwise driven in.

His latest achievement in fastening devices is the "screwnail," combining the driving qualities of a nail and the holding qualities of a screw in fastening sheet metal to wood.

Floyd T. Taylor, formerly vice-president of the Hanson-Van Winkle-Munning Company, Matawan, N. J., is now with the Bullard-Dunn Process Division of The Bullard Company, Bridgeport, Conn.

R. W. Phillips

R. W. Phillips is one of the leading exponents of metal reclamation and salvage in the United States. He is a prominent figure in the National Association of Waste Material Dealers.

Mr. Phillips has spent practically his whole business life with E. I. DuPont de Nemours and Company of Wilmington, Del., having been with them for 35 years. For the last 23 years he has specialized on the study of salvage and reclamation and the conversion of waste materials into channels of profitable use. Mr. Phillips is the manager of the Salvage and Reclamation Division of the DuPont company, which reclaims enormous quantities of metals.

R. W. Phillips

Mr. Phillips is a vice-president and a member of the Board of Directors of the National Association of Waste Material Dealers. He has also been chairman of the Salvage and Reclamation Division of that association ever since its inception.

E. B. Hazen, president of the Brass Foundry Company, Peoria, Ill., has been elected president of the People's Loan and Homestead Association, Peoria.

F. E. Anderson, formerly with the Florence Stove Company, Kankakee, Ill., has joined the service organization of the Ferro Enamel Supply Company, Cleveland, Ohio.

Joseph D. Lowery has been appointed sales manager of the heavy chemicals division of the Kalbfleisch Corporation, New York. He has been with the company over fifteen years.

Ray H. Wallace, engineer, has been appointed New England manager for the Paasche Airbrush Company of Chicago. New England headquarters are at 126 High Street, Boston, Mass.

E. H. Dix, Jr., research metallurgist of the Aluminum Company of America, New Kensington, Pa., spoke recently before the Hartford chapter of the American Society for Steel Treating. His subject was "Light Alloys in Aircraft Construction."

Albert Higgins, Waterbury, Conn., for many years connected with the Chase Companies, Inc., and companies from which that concern was formed, will leave Waterbury shortly to take the position of superintendent of the tube mill of that company's Cleveland branch.

David Bartlett has been appointed manager of the Chicago branch of the Alexander Milburn Company, Baltimore, Md., manufacturers of acetylene welding and cutting, and paint spraying equipment, carbide lights, etc. The stock of Milburn products at Chicago will be increased, the announcement states, in order to facilitate deliveries to customers in that area.

Thompson A. Lyon, for the past ten years superintendent of the Davis and Hemphill Company, Elkridge, Md., manufacturers of screw machine products, has been appointed plant superintendent of the Alexander Milburn Company, Baltimore, manufacturers of oxy-acetylene apparatus, portable carbide lights and paint and lacquer spray equipment.

W. H. Pease, traffic manager of the Bridgeport Brass Company, Bridgeport, Conn., has been elected president of the New England Traffic League.

Obituaries

E. J. Woodison

E. J. Woodison, president of E. J. Woodison Company, Detroit, Mich., manufacturers of fire brick for foundry facings, other foundry equipment, electroplaters' and polishers' supplies, etc., died of pneumonia on May 23, 1930, at Grace Hospital, Detroit. He was fifty-six.

Mr. Woodison was born at Ridgetown, Ontario, Canada, in 1874. His first connection with the foundry supply business was as a bookkeeper with B. F. Stevens, Detroit, for whom he later became a salesman. After that he was Detroit representative for the S. Obermayer Company, Chicago, Ill. He organized the Detroit Foundry Supply Company in 1904 and acted as president until 1911, when he formed the E. J. Woodison Company. At the time of his death he was also president of the E. J. Woodison Company, Ltd., Toronto; vice-president of the Canadian Foundry Supplies and Equipment, Ltd., Montreal; vice-president of M. A. Bell Company, St. Louis; president of Acme Foundry Company, Detroit; a director of the Standard Foundry Supply Company, Walkerville, Ont.; director, Apex Foundry Company, Detroit; director, The Lee Foundry and Machine Company, Pontiac, Mich.; and he had interests in still other concerns, mainly in the foundry line. He lived at Walled Lake, Mich., near Detroit.

E. J. Woodison

William Henry Bristol

Professor William Henry Bristol of Waterbury, Conn., inventor of the Bristol phone and many other important devices, died on June 18, 1930, at New Haven Hospital, in his seventieth year. He was president of the Bristol Company, Waterbury, manufacturers of recording instruments of many kinds.

Professor Bristol was born at Waterbury in 1859. He became a pioneer in the design and use of recording instruments. His phone was a recent development which perfected the synchronization of sound and action in motion pictures. He had an international reputation as a scientist and inventor. During his life he developed a complete line of recording instruments for nearly every industrial purpose.

Henry W. Mahley

Henry W. Mahley, treasurer of the Onondaga Brass Company, Syracuse, N. Y., died recently at Syracuse, in his sixty-fourth year. He was a figure in the business activity of Central New York State for more than twenty-five years.

William E. Fulton

William E. Fulton, Waterbury, Conn., retired president of the Farrell Foundry and Machine Company, died July 2, 1930, after a short illness, He was seventy-seven years old, a native of Brooklyn, N. Y., and had been active in Waterbury industry for many years.

Elmer A. Sperry

Elmer A. Sperry, world famous inventor and engineer, died on June 16, 1930, at St. John's Hospital, Brooklyn, N. Y., from complications following a surgical operation a few weeks previously. He was head of the Sperry Gyroscope Company, Brooklyn, N. Y., which he founded for the purpose of manufacturing the gyro-stabilizers and gyro-compasses for navigation which he had invented and for which he is best known. He was also president last year of the American Society of Mechanical Engineers.

Mr. Sperry was born at Cortland, N. Y., in 1860. He was educated at the State Normal School at Cortland, and attended Cornell University. After a year at the University, he perfected a dynamo. A few years later he organized the Sperry Electric Company which made and sold devices he invented. In all he is credited with some four hundred inventions. His stabilizers, utilizing the principle of the gyroscope, are used on ships and in airplanes and aerial torpedoes. His gyro-compass eliminated the variations due to the earth's magnetism which are usually noticeable in the ordinary compass. Only recently he perfected a device which detects fissures in steel rails without necessity of cutting up the rail. He was the recipient of many awards. To readers of this journal it is of interest to know that a great many of his inventions are made in whole or part of non-ferrous metals of many kinds, and that they employ many sorts of coatings, finishes and electrodeposits. He was one of the founders of the American Electrochemical Society and the American Institute of Electrical Engineers, and a member of the Society of Automotive Engineers, American Iron and Steel Institute and other scientific societies.

Roswell A. Moore

Roswell A. Moore, secretary-treasurer of the Waterbury Buckle Company, Waterbury, Conn., died in Paris, France, on June 1, 1930, following an attack of pneumonia. He was born in Kensington, Conn., sixty-four years ago and received his early manufacturing training with the Trout and Hine Company of New Britain. Later he established a manufacturing business in Kensington which was burned out in 1906.

Mr. Moore then came to the Waterbury Buckle Company, where his broad experience and knowledge made him an able successor to the late Julius Maltby.

He was married in 1909. Besides Mrs. Adeline C. Moore of Toledo, his widow, he is survived by two step-children, Castle Moore of Brooklyn, N. Y., and Mrs. Wooster Canfield of Waterbury; a sister, Margery Moore, of Kensington; and an aunt, Alice Norton of Kensington. Burial was in the family plot in Kensington.

W. R. B.

William H. Kelley

William H. Kelley, inventor of "Kelley metal," died at his home in Los Angeles, Calif., June 6, 1930. He was sixty-six years old and had been ill for a long time.

Mr. Kelley was a marine engineer and had a lively career on the sea for many years. He was the youngest chief engineer ever to take a ship out of San Francisco, he served on several United tates transports, and when the S. S. Morgan City sank during the Spanish-American War, he went down as a diver and retrieved a sack containing $250,000 in postage stamps as well as other valuable cargo.

Mr. Kelley's invention in the metal line is an alloy of lead and copper which is used for airplane, automobile and marine engine bearings.

News of the Industry

Industrial and Financial Events

International Nickel Company

International Nickel Company of Canada, Ltd., Toronto, Canada, will hold a special general stockholders' meeting July 25th to approve increase of authorized common capital stock from 13,928,594 shares to 15,000,000. Capital expenditures of over $52,000,000 have been required for expansion and development of the company's properties in United States, Canada and Great Britain. About 81% of this program has been completed at cost of about $42,000,000, and further expenditure of about $10,000,000 will be made during the next two years. Additional common capital stock to be issued under the plan which the directors will ask stockholders to approve will provide about $16,000,000, the surplus of which, after the mentioned expenses are met, will serve to keep the company in its usual strong cash position, according to the firm's announcement. The company controls, among other properties, the International Nickel Company (New Jersey) and the Mond Nickel Company, Ltd.

Aluminum Colors, Incorporated

Aluminum Colors, Inc., Indianapolis, Ind., a new company recently formed, has purchased from Metals Protection Corporation, same city, all equipment, patents and all that part of its business in connection with the "Alumilite" process. The new concern will continue as licensor of the process. Officers of Aluminum Colors, Inc., are M. L. Gould, president; Fred A. Wales, vice-president; John D. Gould, secretary-treasurer. The directorate is stated to include some outstanding citizens of Indianapolis. President Gould was formerly engaged in the coal mining business, as was his son, the secretary-treasurer. Mr. Wales was with the Aluminum Company of America for 14 years prior to his present connection. He was engaged in sales engineering for that company.

The "Alumilite" process for finishing aluminum in various colors was described on page 189 of the April, 1930, issue of THE METAL INDUSTRY.

Scovill Manufacturing Company

The Scovill Manufacturing Company, Waterbury, Conn., directors at the meeting held May 31, declared a quarterly dividend of $1 per common share to stockholders of record at the close of the business on June 16th. Cash distribution of the dividends is scheduled for July 1st at which time they are payable. The dividend is at the rate of $4 annually which was inaugurated several quarters ago.

An inquiry relative to working conditions at the factory resulted in the information that there has been a consistent pick-up in the rate of employment, not noticeable to any great degree, but nevertheless apparent in the increased production.

Sitter Brass and Aluminum Works

The Sitter Brass and Aluminum Works, which for many years has been in operation at 2668 Maple Street, Erie, Pa., as a partnership between Frank P. and Philip C. Sitter, has been dissolved. Frank P. Sitter will continue the operation of the plant and business under the same firm name, Phillip C. Sitter withdrawing from the concern.

Beardsley and Wolcott

Beardsley and Wolcott Manufacturing Company, Waterbury, Conn., is reported to be planning a program of refinancing which is expected to place the company in a sound position. The company is a large manufacturer of hardware. A short time ago reorganization of the company was accomplished, resulting in the resignation of the president, as stated under our "Waterbury" news on one of the following pages of this issue.

Roessler and Hasslacher Convention

The Roessler and Hasslacher Chemical Company, New York, held its annual sales and service convention at Niagara Falls, N. Y., June 9, 10 and 11. In attendance were executives from the company's manufacturing plants and New York offices, district sales managers, sales and service men from various branches in the United States, Canada and Mexico. The convention was presided over by Dr. H. R. Carveth, President of the company. Activities of the convention included inspection tours about the Niagara Falls plant, visits being made to several of the process departments. The business sessions were featured by pertinent papers discussing manufacture, service and sales of R. and H. products. The annual banquet was held on the evening of June 10 at the General Brock Hotel, Niagara Falls, Ont. The speaker of the evening was J. E. Hatt, general manager, du Pont Cellophane Company, New York.

Porcelain Enamelers Organize

Representatives of the porcelain enameling industry met on May 9 at Cleveland, Ohio, for a conference on methods of increasing the use of their products, according to *The Enamelist*, a trade paper published in that city. A committee was appointed consisting of leading executives in the industry. They will study ways and means of financing a three-year campaign of advertising and sales promotion for the benefit of the industry. This committee met on June 17 and, after discussion, decided the time was not yet ripe for a national advertising campaign. However, a paid secretary will be employed to continue investigation of the possibilities of such a campaign and to determine means of establishing it. The committee is headed by William Hogensen, president, Chicago Vitreous Enamel Products Company, Cicero, Ill.

Abrasive Simplification

A general conference of representatives of manufacturers, and users of aluminum oxide and silicon carbide abrasives for polishing uses and for grinding wheel manufacture, recently held under the auspices of the Division of Simplified Practice of the Bureau of Standards, Department of Commerce, at Washington, D. C., unanimously approved a simplified practice recommendation for these products. The simplification program is based on a table of allowable limits for the sizing of these abrasives as proposed by the producers of electric furnace abrasives. The appointment of a standing committee of the industry, composed of three representatives each of the manufacturers and the users, was authorized by the conference. The recommendation, subject to the recorded approval of the industry, will be effective September 1, 1930. In addition to the appointment of a standing committee, those in attendance were of the opinion that a technical committee should be formed for the purpose of conducting research on screens used in grading abrasive grains. At the suggestion of those present, two abrasive manufacturers, two screen manufacturers and two consumers will be invited to serve on this committee.

Brass in Industrial Art

E. H. Davis, statistician of the Scovill Manufacturing Company, Waterbury, Conn., was among the speakers on the program for the New England Industrial Art Conference which took place recently at the Hotel Copley-Plaza at Boston, on new modes in brass goods.

This conference is designed to bring before New England manufacturers successful examples of the application of art and style to different types of New England made goods, appreciating that the attractiveness, appeal and value of many New England quality products have been greatly increased by the application of art and style elements.

Copper Production and Consumption

World production and consumption of copper in 1929 reported last month by the American Bureau of Metal Statistics. The figures, computed on basis of mined, smelted and refined copper, are shown in the table below. It should be borne in mind that mine output is represented for each copper-mining country, but smeltery and refinery production indicates the output of plants in the countries enumerated, from ore of any origin, not necessarily from mines in the country for which any given figure stands. The totals therefore are divergent to some extent. Since consumption figures refer to each separate country (being the nearest approximation possible) the true comparison between output and use should be made by comparing the consumption with the refinery production in each case as well as for the totals. Figures are in tons of 2,000 pounds.

Productive Consumption

	Mine	Smeltery	Refinery	
United States	1,026,348	1,179,269	1,542,238	1,119,400
Mexico	86,759	63,795	.....	.....
Canada	121,151	79,186	2,913	22,700
Cuba	15,740	.....	.....	.....
Bolivia	7,700	.....	.....	.....
Chile	348,365	333,296	266,706	.....
Peru	59,980	59,527	.....	.....
Austria	3,856	3,856	3,856	19,900
France	2,205	2,205	(a)	150,900
Germany	28,660	59,083	131,615	238,900
Great Britain	.....	19,841	(a)	171,500
Jugoslavia	23,503	23,503	.....	(a)
Norway	16,158	2,633	(a)	(a)
Russia	29,762	29,762	36,581	57,300
Spain and Portugal	56,660	24,768	(a)	19,500
Sweden	3,500	5,271	(a)	29,100
Other Europe	5,512	*12,000	122,542	165,600
Japan	82,281	82,281	82,281	77,600
India	6,800	1,976	1,832	(b)
Other Asia	2,000	2,000	.....	10,600
Australasia	15,979	13,907	12,179	8,800
Africa	161,191	147,880	15,335	12,100
Totals	2,104,110	2,146,039	2,218,078	2,103,900

(a) Included in "Other Europe."
(b) Included in "Other Asia."
* Estimated.

George L. Claflin Company Moves

The George L. Claflin Company, one of the largest jewelry supply houses, formerly located at 70 South Main Street, has removed to a new home at 150-160 Dorrance Street, Providence, R. I., near the heart of the manufacturing jewelry district. The new home is entirely modern in fittings and arrangement. The offices and various departments are arranged contiguously so as to be easily accessible to the many customers whether in quest of jewelers' or mill supplies, or paints, oils, varnishes, drugs, and many other commodities made.

North and Judd Company Expands

North and Judd Company, New Britain, Conn., manufacturers of special hardware, has purchased the business of the O. B. North Company, New Haven, Conn., for the past eighty years makers of saddlery hardware and other products, and for the past two years in the hands of receivers. The buildings were not taken over, but equipment, good will and business were acquired.

Industrial Exhibit at Newark

An exhibit of two hundred electrically operated models which demonstrate the mechanical principles upon which modern industry is founded was put on view May 13th in the Newark Museum, Newark, N. J., with a number of familiar machines, domestic and industrial, which are applications of these basic principles. The exhibit of machine models, made by W. M. Clark of South Orange, N. J., and a gift of Louis Bamberger to the Museum, rounds out the Museum's collections on the industrial and scientific side. Applications of mechanical principles to industrial uses are demonstrated also in exhibits lent by the Sacks-Barlow Foundries, Thomas A. Edison, Inc., Benjamin Jarvis, Inc., Weston Electrical Instrument Corporation and the magazine "Fortune." The exhibition will continue through the summer.

Production of Metallic Cadmium

The production of metallic cadmium in the United States in 1929 amounted to 2,481,427 pounds, valued at $2,009,956, as reported by producers to the United States Bureau of Mines, Department of Commerce. This is an increase of 32 per cent in quantity over the production of 1,875,896 pounds in 1928, which was 75 per cent higher than production in 1927 and prior to 1929 the largest annual production on record. The average value reported by producers in 1929 was 81 cents a pound compared with 61 cents a pound in 1928. There were 214,307 pounds of cadmium, valued at $184,527, imported into the United States during 1929, compared with 233,101 pounds, valued at $128,901, in 1928.

In addition to metallic cadmium, domestic manufacturers reported production of the following cadmium compounds in 1929: Cadmium sulphide, cadmium sulphate, cadmium hydrate, cadmium oxide, cadmium chloride, cadmium acetate, and cadmium lithopone. The estimated cadmium content of cadmium compounds produced was 433,300 pounds, valued at $498,734, in 1929, compared with 239,900 pounds, valued at $228,013, in 1928.

Ingot Brass

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of May, 1930, amounted to a total of 6,885 tons, according to announcement made by the Institute.

The Institute reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending June 20th, as follows:

Commercial 80-10-10 (1% impurities)	12.596c
Commercial 78% metal	10.732c
Commercial 81% metal	11.442c
Commercial 83% metal	11.191c
Commercial 85-5-5-5	11.681c
Commercial No. 1 yellow brass ingot	9.417c

New Companies

The following concerns have been incorporated or organized recently:

O. Edwin Decker Bronze Foundry, Inc., 4041 Ridge Avenue, Philadelphia, Pa.; by **O. Edwin Decker,** formerly general manager of **Paul S. Reeves and Company.** New plant is equipped with modern machinery and has facilities for pouring as much as 3,600 pounds of metal for a single casting.

Manor Metalcraft Corporation, Columbia, Pa.; organized to take over plant and business of Lancaster Metalcraft Corporation, manufacturing metal stampings for various purposes and such products as hat clutches, small electric fans and motors, switch boards, mixing devices, and to do general machine shop work. Officers are **J. F. Horting,** president; **W. L. Kaufhold,** treasurer and general manager; **C. J. Rhen,** secretary.

Universal Brass Works, Inc., 209 Vine Street, Philadelphia, Pa.; organized to take over business of the same name, which will be enlarged. Company makes brass tube arms, brackets, turnings, etc., for lighting fixtures. **S. Schwartz** is treasurer.

Schultze Die Casting Company, Toledo, Ohio; to manufacture and deal in dies, castings and machinery. **J. A. Schultze,** formerly vice-president and general manager of the Doehler **Die Casting Company,** New York, is interested in the company.

St. Catherines Brass Works, Ltd., St. Catherines, Ont., Canada. $50,000 capital; to deal in aluminum, bronze, copper and Monel metal castings; by J. F. Pepler and F. M. Sexton; manager is J. E. Riffer, formerly proprietor.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

JULY 1, 1930.

Mason T. Adams, vice-president and general manager of the **Seth Thomas Clock Company** of Thomaston, has been elected president of the **Beardsley and Wolcott Manufacturing Company,** succeeding **Charles E. Beardsley,** who resigned a month ago. **Mr. Adams** and **Warren F. Kaynor** have been added to the board of directors. Mr. Kaynor is president and general manager of the **Waterbury Button Company.** This action is part of the general reorganization of the company following the resignation of Mr. Beardsley and the election of **R. W. Reid** of Providence as vice-president and general manager of the local company.

Jerome R. La Vigne of this city is expected to be named general manager of the **Waterbury Buckle Company** succeeding the late **Roswell A. Moore.** (See "Obituaries.") He had been assistant secretary of the company for some years and connected with it for twenty. The president of the company, **Julius B. Smith,** is expected to take over Mr. Moore's other office, that of treasurer. The directors will meet shortly to fill these vacancies.

The Lux Clock Company has been granted a permit to erect a building to cost $50,000. It will be four stories, brick, 33 feet wide and 81 feet long. The contract has been awarded to **Oscar LaCroix.**

The will of the late Roswell A. Moore, treasurer and general manager of the Waterbury Buckle Company, filed here last month, shows a net estate of about $200,000. With the exception of a few bequests, the estate goes to his widow.

The Waterbury Clock Company closed June 31, to reopen July 12. This is the usual summer shutdown for inventory and employes' vacation. Many had feared that this year the shutdown would be longer because of the depression.

Frederick S. Chase, at last month's meeting of the **Chase Foremen's Association,** said he looks for a gradual improvement in business from now on as he is sure the bottom has been reached in the present business depression.

The Chase Metal Works opened a restaurant for its employes last month with **John W. Jaeger,** former inspector in the plant, as manager. Since opening it has been serving 350 or more a day. A tunnel has been built from the main factory buildings to the restaurant so that employes may reach it on stormy days without going outside.

A. J. German, chief engineer of the **Scovill Manufacturing Company,** left last month to attend the world power conference in Berlin, Germany, as one of Connecticut's industrial representatives. Engineers, economists, chiefs of industry and specialists from 45 countries are represented. **W. H. Bassett,** chief metallurgist of the **American Brass Company,** and president of the **American Institute of Mining and Metallurgical Engineers,** is a member of the American committee.

Albert A. Johnson, noted economist, who has been studying industrial conditions in Russia, is coming here this month to talk to local industrial leaders in the interest of increased trade with Russia.

Devid Walsh and **Fred Reyher** were arrested last month as the result of an investigation to discover the reason for the frequent disappearance of metal from the Scovill Manufacturing Company plants. They are still awaiting trial on the charge of theft.

W. R. B.

Connecticut Notes

JULY 1, 1930.

BRIDGEPORT.—The same influence that brought about Charles E. Beardsley's resignation as president-treasurer of the Beardsley and Wolcott Manufacturing Company of Waterbury is believed to be responsible for his resignation as president of the **Bridgeport Brass Company** here. Substantial amounts of the stock of the local company are controlled by Waterbury financial interests that are also interested in Beardsley and Wolcott. They were responsible for bringing Mr. Beardsley here to head the Bridgeport Brass Company and it is said that their demands for reorganization of Beardsley and Wolcott brought about his resignation from the Waterbury concern which had the natural sequence of bringing about his resignation from the Bridgeport company. The reports of the local company have been quite satisfactory recently, if the current business depression is considered. This is attributed largely to **Ralph E. Day's** services as general manager. Following Mr. Beardsley's resignation, the directors of Bridgeport Brass immediately elected Mr. Day president. Mr. Day was superintendent of the Waterbury plants of the **American Brass Company** for 16 years and was transferred to the Hastings-on-the-Hudson plant of that company in 1923. In 1928 he became vice-president and general manager of the Bridgeport Brass Company.

The Rayon Equipment and Engineering Company, which is to make rayon-making machinery, has started operations here. It is capitalized at $250,000 and expects to employ about 400 men. It is now occupying the plant of the **Bridgeport Engineering Company. William J. Bartley,** formerly president of the **Engineering Company,** is production manager of the new concern. It is financed by New York interests who control the **Rayon Equipment Company** of that city.

HARTFORD.—Bush Manufacturing Company has awarded a contract for a one-story factory building 80 by 120 feet. It recently received an order for a quantity of copper and brass coils for cooling units from the **Majestic Household Utilities Company,** to be used in refrigerator condensers which must be turned out at the rate of a carload a week starting August 1. The building contract calls for completion in 30 days.

Another factory addition is to be built by the **Bush Manufacturing Company;** specifications are soon to be announced.

A government contract for airplane engines for the army, amounting to over $2,000,000, has been received by **Pratt and Whitney Aircraft Company** of this city.

Arrow-Hart and Hegeman Electric Company has declared a dividend of $1.62½ on the preferred and 75 cents on the common, payable July 1 to stock of record June 24.

MERIDEN.—International Silver Company has received an order for more than 100,000 pieces of silverware for the new Waldorf-Astoria Hotel in New York, which will amount to about $175,000. The company will have to make new dies as the silver is to be of a new design.

Manning Bowman Company directors have declared a dividend of 37½ cents a share on the A stock and 12½ cents a share on the B stock, payable July 1.

The Ivanhoe sales division of the **Miller Company** will be moved from Cleveland, Ohio, to the local plant, thus concentrating sales in this city.

William B. Griffin, the Bridgeport sales and advertising manager of the **Holmes and Edwards branch,** has been made sales and advertising manager of the entire **International Silver Company.** He entered the Bridgeport company's employ 20 years ago and has become one of the recognized advertising experts of the country.

NEW BRITAIN.—Landers, Frary and Clark directors have declared the regular dividend of 75 cents a share and an extra dividend of 25 cents payable July 1 to stock of record June 20.

The Stanley Works directors have declared a dividend of 2½ per cent on the common and 1½ per cent on the preferred stock, the first payable July 1 and the second August 15.

The estate of the late **Hilmer Kvistrom,** an employee of the **New Britain Machine Company,** will receive $1,000 insurance, although he had not paid a cent on it. The company adopted a group insurance plan for all its help and he died before it was necessary for him to make even the first payment on it.

WINSTED.—Winsted Insulated Wire Company stockholders have voted to purchase the building formerly owned by the **Empire Knife Company.** The purchase will be financed by the sale of 10,000 shares of stock at $11 a share which will also be used to purchase additional equipment.

TORRINGTON.—An extra dividend of 50 cents a share has been declared by the **Torrington Company.** This makes a total dividend payment for the year of $4 a share compared with $4.75 a year the previous year. The company is able to pay out substantially all of its earnings because of its strong cash position. At the end of the last fiscal year its working capital was $7,511,807, of which cash and government securities totaled $5,256,187.

TERRYVILLE.—Eagle Lock Company closed on June 13 until July 7 for inventory and vacation. This is the first time in 25 years that the plant has closed for such a long period for inventory.

SOUTHINGTON.—Southington Hardware Company is now operating on a schedule of 50 hours weekly instead of 32, and is employing its full working force due to having received a large contract.

STAMFORD.—Norma Hoffman Bearing Corporation is building a large addition to its plant here.

SHELTON.—Naugatuck Crucible Company of this city has acquired the assets of the **Chicago Crucible Company** and will move the latter's machinery and equipment to this city.

BRISTOL.—Marvin D. Edgerton died at his home here June 20. He was superintendent of the **Bristol Manufacturing Company** for many years and at the time of his death was proprietor of the **Penfield Saw Works** of this city. He was 67 years old and leaves his wife and one son, **Starr Edgerton.**

W. R. B.

Providence, Rhode Island

JULY 1, 1930.

The close of the first half of the year finds the metal trades outside of the building branches almost at a standstill and facing what is apparently the most discouraging period that has been experienced since the World War. Although the jewelry and allied trades are in the midst of the seasonable summer curtailment period, the prospects for an early, or very busy, fall season are anything but bright. Reports from various surveys indicate that the number of unemployed in this city and its suburbs is the largest known here in many years, notwithstanding special efforts that are being made by various agencies—municipal, public and private—to furnish work.

Anaconda Wire and Cable Company of Pawtucket has purchased the two-story building and 144,000 square feet of land at Main and Moshassuck streets, opposite its present plant, to which the lacquer process department of the company will be removed. The new building will afford upwards of 25,000 square feet of additional floor and, according to **Manager Emerson P. Smith,** will enable the company to relieve congestion in the company's four-story plant. There are 250 persons employed in the Pawtucket plant, which is one of nine operated by the company.

Langelier Company, manufacturers of special machinery and machine products at Arlington, has purchased the entire capital stock of **Adams Brothers, Inc.,** according to **Herbert K. Allard,** president of the Langelier Company, which, he states, is the first of several purchases he intends to make under present plans for expansion. Several of the companies under consideration are located outside of Providence and, in the event of their purchase, will be brought to the latter city.

Providence Branch of the **Associated Brass Founders of New England** at its last monthly meeting discussed business prospects for the remainder of the year and the production costs of brass castings, the discussion being opened by an address by **Secretary R. B. Bonner.** Dinner preceded the business session with **W. G. Morgan** in charge. A detailed report was made of the recent organization of the **Connecticut Branch** at Hartford, and Mr. Bonner gave an interesting report of the parent organization, to which **James Rothwell** was elected a delegate.

Rex Manufacturing Company has removed from 14 Blount Street to larger quarters at 69 Gordon Avenue.

George Moffitt presided at the business meeting and dinner last month of the **Foremen's Association** of the **Rhode Island Tool Company,** held at the Dreyfus Hotel, Providence. The evening was devoted entirely to sociability following a brief business session.

The Metal Finding Manufacturers' Association held its June meeting at the Providence-Biltmore Hotel, with a large attendance, **President Frank E. Farnham** presiding. Following the dinner a short business session was held, at which President Farnham introduced the matter of uniform closing of the factories of the members during the summer months. There was a general discussion of the matter and the consensus of opinion was that it would not be practicable nor desirable to attempt uniform closing of the factories this year. The report of the treasurer was read and approved.

Edwin Speidel and **Karl G. Augenstein** have been granted a patent for a machine and method of making chain and have assigned the same to the **Automatic Gold Chain Company** of Providence.

George L. Tillinghast, of the **L. H. Tillinghast Supply Company,** was elected treasurer of the **Rhode Island Association of Credit Men** last month at the annual meeting of the board of directors. **Henry J. Becker** of the **Narragansett Machine Company** was elected president.

E. K. Strachan of the **Providence-Attleboro Branch** of the **American Electroplaters' Society** led the discussion on "The Education of Electroplaters" at the Tuesday, July 1st, session of the annual convention of the national organization being held at the Mayflower Hotel, Washington, June 30-July 1.

Frank H. Fairbrother, who has been identified for many years with the electroplating business of this city, has become associated with **The Manufacturers' Supply Company,** Providence, as sales representative.

—W. H. M.

Middle Atlantic States

Trenton, New Jersey

JULY 1, 1930.

Operations of the **Jordan L. Mott Company** are uncertain and employes are frequently laid off in the middle of the week and told not to report until the following Monday. Dull seasons in the pottery trade tell on the metal plants.

John A. Roebling's Sons Company is gradually adding units to its big plant. **Hoggson Brothers,** New York, were recently awarded the contract to build two additional stories to the office building, and the **J. W. Ferguson Company,** Paterson, N. J., were given a contract for the replacement of new units. A strike of the structural iron workers has tied up construction on these jobs. **William A. Anderson,** vice-president and treasurer of the Roebling Company, declared that under the terms of the contracts any delay caused by labor disputes provides sufficient grounds for cancellation. Therefore, the company has terminated the contracts. The expense entailed each day of inactivity is high and the Roebling company may resort to the old plan of erecting its own buildings. This plan was carried on by the company up to four years ago.

Continental Can Company, one of the largest of its kind in the country, announces that it will establish a factory in Camden and will employ between 500 and 600 hands. Negotiations concerning locating in Camden have been under way for some time. The can company is now operating 30 plants in various parts of the country. The new structure will be six stories in height. The main offices of the Continental Can Company are at 100 East 42nd Street, New York.

The following concerns have been newly chartered here: **Venezuela Roscio Company,** Bayonne, mining and quarrying gold and silver, $150,000. **Beetsal, Inc.,** Irvington, manufacture tools, $50,000 preferred and 2,000 shares common. **Hy-Co Laboratories, Inc.,** East Orange, manufacture radio supplies, 100 shares common. **Patent Chemicals, Inc.,** Jersey City, manufacture chemicals, 5,000 shares no par. **George Elmore Clark, Inc.,** Palisade, manufacture jewelry, $125,000. **Miessner Inventions, Inc.,** Short Hills, manufacture electrical devices, 1,000 shares no par. **Hudson Tin Manufacturing Company, Inc.,** Jersey City, manufacture tinware, $100,000.

—C. A. L.

Newark, New Jersey

JULY 1, 1930.

The County Tax Board has granted a $55,000 remission on a personal tax assessment of $85,000 on the jewelry business of **Allsopp Brothers, Inc.,** 26 Camp Street. **George A. Allsopp** explained that there was a depreciation of values and considerable stock has been disposed of. The city explained the assessments as fixed by the assessors was due to the fact that the company has been classed as a big manufacturing concern and had not filed a statement.

Vice-Chancellor Church has appointed **C. Wallace Vail** statutory receiver for **Crown Manufacturing Company,** 101 Arlington Street, manufacturers of watch crowns. Vail had been appointed custodian receiver on application of **Eugene D. Ringle,** vice-president of the concern, a creditor for $1,000 in salaries, and owner of 100 shares of no par stock valued at $100 a share. Ringle charged that the company had been operating at a loss and that all except **Eugene P. Ledos,** president, and **William Arthur,** secretary, had been laid off. He stated assets would not bring more than $10,000 at a forced sale, while liabilities were between $12,000 and $15,000. The company was incorporated in March, 1928.

About 250 engineers, members of the **American Welding Society,** recently made an inspection of the new **Westinghouse Electric and Manufacturing Company** plant at Port Newark, N. J. Officials and executives of the Westinghouse company in New York were in charge of the party. The first unit of the plant, at Haynes Avenue and Route 25, is being built, the welding process being used in steel erection.

The following Newark concerns were chartered during the month: **Pontiac Company,** manufacturing jewelry, 2,500 shares no par. **Adolph Schror Laboratories, Inc.,** chemicals, $125,000. **Sterling Lighting Fixture Manufacturing Company,** manufacture lighting fixtures, 2,500 shares no par. — C. A. L.

Middle Western States

Detroit, Michigan

JULY 1, 1930.

Industrial conditions in the non-ferrous metal field seem to be entering a quiet summer period. Production at many plants has been on a gradual decline for a considerable time, and now it is at the lowest ebb of the year thus far.

The plating industry is in practically the same condition, with plants engaged on part time or doing nothing at all. In some instances plants have been forced to make wage cuts as well as to operate on part time.

This dullness, however, is not particularly outstanding, as practically the same condition prevails in all other lines.

A substantial force is now busy reconditioning the plant at South Park, Port Huron, Mich., which is to be occupied by the **American Enameled Magnet Wire Company.** The plant formerly was operated by the **Port Huron Engine and Thresher Company.** It will employ more than 300 persons, it is stated.

Chamber of Commerce of Port Huron, Mich., has raised $50,000, which will be turned over to the American Enameled Magnet Wire Company as a part of its expenses in moving from Muskegon to Port Huron. The company is owned by the **Electric Auto-Lite Company** of Toledo, Ohio.

W. E. Marchand, Inc., manufacturer of metal airplane ribs, has been purchased by the **Aircraft Products Corporation.** Mr. Marchand has joined the force of the parent company as supervisor and designer in the rib department. His company was organized two years ago and supplied many airplane manufacturers with ribs. Addition of this new department gives the Aircraft Products Corporation 13 major airplane parts in its line.

The Pyramid Bronze and Aluminum Company, 5861 Forsyth Street, Detroit, has recently been incorporated. It manufactures bronze and aluminum products. The owners are **Robert Hubbert, William B. Rickston** and **H. I. Ash.**

Wallace J. Ivers Company, 2242 Larned Street, Detroit, is a new Michigan corporation. It is engaged in a general metal plating and finishing business. The stockholders are **Wallace J. Ivers, A. A. Anderson** and **E. R. Ivers.**

The Gerson and Carey Company, brass founders, through a supreme court decision, has been awarded $11,500 damages against the city of Lansing, Mich., for cutting off its direct access to the street by construction of the Kalamazoo Street viaduct. The bridge reaches a height of 24 feet in front of the Gerson and Carey plant.

Essex Wire Company, now occupying a portion of the old Ford plant in Highland Park, Mich., a suburb of Detroit, is now employing 800 persons and is exceedingly busy supplying large automobile manufacturers with battery wire, magnet wire, insulated wire assemblies, bare wire products, etc. The company also is engaged on a large Ford contract and at present is operating at capacity.

Parker Rust Proof Company, Detroit, manufacturers of corrosion resisting chemicals and equipment, and also doing nickel and copper plating, is operating at capacity. The company, it is stated, recently received a large contract from the **Ford Motor Co.** which assures the Parker firm a high rate of operations for a considerable time.

Albert C. Picard, division manager of the McCord Radiator and Manufacturing Company, died recently at his home in Detroit following an attack of bronchial pneumonia. He was 59 years old. Mr. Picard had been with the McCord organization for 20 years.

More than 6,000,000 square feet of metal are being chromium plated every month, according to **Richard Schneidewind,** of the Department of Engineering Research at the University of Michigan, Ann Arbor. Much of the scientific background for recent rapid developments in this field, he says, has been set up in the laboratories of the University. It is apparent, Mr. Schneidewind says, that although the technical details of the process have been fairly well worked out for certain types of work, chromium plating has not yet been exploited to its full capacity. Undoubtedly research and industry will find many more interesting and valuable applications for it in the next few years, he believes.

Grand Rapids Metal Craft Corporation is planning to erect a new plant this year at a cost of $300,000, according to announcement made recently by **R. W. Hook,** president. The plant, containing 120,000 square feet of floor space, is to house the operations of the **Metal Craft Company** and two subsidiaries, the **National Moulding Company** and the **Metal Craft Heater Corporation.**

Thompson Products, Inc., aeronautical division, announces receipt of an order for 2,000 aircraft valves to be used in 100 Bristol Jupiter engines being built by the **E. W. Bliss Company,** Brooklyn, N. Y. —F. J. H.

Wisconsin Notes

JULY 1, 1930.

Terming the year 1930 one for courage, manufacturers in the Milwaukee industrial area express conviction that at least the present level of activity will continue during the next two months. Increases are forecast as soon as greater confidence prevails. A number of manufacturers declared there would be firm foundation for industrial activity during the fall, especially since the factors of restricted buying and unsteady commodity prices should be eliminated by that time.

Seasonal activity in the zinc oxide market is responsible for the restoration of normal working schedules at the **Mineral Point Zinc Company** plant in Mineral Point, Wis. Furnaces idle during the winter are again white hot and more men have been returned to the employment force. The zinc oxide manufactured in the Wisconsin city is used extensively as automobile tire filler and in the manufacture of paint, oil cloth, linoleum and in the drug trades.

Due to the tremendous increase in business, the **Wisconsin Radiator Furniture Company** at Mayville has started work on the erection of a new $30,000 addition to its plant. Two new offices will be included in the addition and a space 30 by 60 feet will be added to the finishing department. The metal department will have 47x175 feet additional space in the new plant. Allowance is to be made for further expansion. —A. P. N.

Other Countries

Birmingham, England

JUNE 20, 1930.

The annual meeting of the **British Non-Ferrous Metals Research Association** was held in Birmingham on June 3, and in the report the importance of the pursuit of intensive scientific research work in industry was emphasized. "The keenest competition from abroad," says the report, "comes from those countries where very active scientific and industrial research in metals is in progress. Within the last few years large provision has been made in Germany and the United States of America for co-operative and industrial research, the expansion of which is taking place at a prodigious rate. The question, therefore, deserves stressing as to whether we in this country are doing anything like enough to maintain our competitive power in so far as it can undoubtedly be assisted by the application of science to industry."

Referring to the progress of the Association during the past ten years, the report stated that they now possessed the nucleus of a really strong organization, much more competent today to afford service than ever before. They realized that even investigations which in the early days appeared too abstract or fundamental did in time promise a harvest of new knowledge which could be applied to immediate industrial objectives. The Association has received more encouragement from industrialists during the past year and subscriptions have increased from £9167 to £11,434.

There is a possibility of a large copper works at Walsall, near Birmingham, closing down as the result of differences between the directorate and the local town council regarding an alleged smoke nuisance emanating from the works. The town council has approved a recommendation of the Health Committee that failing the abatement of the alleged nuisance within a given period, High Court proceedings would be taken. It is this threat which has caused the directors of the company to give notice to about 150 workpeople. The manager of the works denies that the smoke emanating from the chimney is harmful. He declares that he has worked for 40 years amongst processes such as those which the company is carrying on and has never experienced any ill effects. Neither was there much sickness among the men employed at the works, he said.

Birmingham makers of electroplate are moderately well situated for business. Canada is still one of the best markets for tableware, and orders from that source provide a good deal of employment. The heavy tariffs in Australia, however, are a serious matter to shippers, especially in the cheaper products, as it does not pay Australian importers to take British goods after freights and tariffs are added to original cost. Manufacturers are hoping that some modification of the recent embargo may take place as the result of meetings which are to be held in July. The same complaint is voiced amongst Birmingham brassfounders, who say that business is checked in many lines. Trade generally is very moderate and, though improvement has been experienced at one or two works it does not represent a general move forward. The fall in the price of copper has not been large enough to make any difference to selling prices of stamped brassfoundry. The rollers of brass and copper tubes are amongst those trades which are sharing in the general depression.

Makers of aluminum hollow-ware have a moderate amount of orders on hand. Export trade is far from healthy, but there are hopes that later in the year there will be a revival of interest in some of the markets where trading at the moment seems most difficult. Domestic ware is perhaps one of the last trades to feel the effect of general depression throughout the country, as the public does not willingly curtail the amount spent on utensils, whereas luxuries have to be done without. There is a move towards a better quality of domestic ware in aluminum which is rapidly gaining ground.—J. A. H.

Business Items—Verified

Bruce Products Corporation, Howell, Mich., has opened offices at Detroit, Mich., in the Twelfth Street Terminal Building, 5712 Twelfth Street.

C. M. Grey Manufacturing Company, 358 Central Avenue, East Orange, N. J., die casters, have plans for a new $70,000 factory, but has held up the project due to a dispute with the city over zoning restrictions.

The Bunting Brass and Bronze Company, Toledo, Ohio, has relocated its Chicago branch sales office and warehouse at 1221 West Washington Boulevard, Chicago, Ill. Former address was on South Michigan Avenue.

American Arch Company, manufacturer of suspended arches and air-cooled walls for boiler and industrial furnaces, has removed its main offices from 17 East 42nd Street to the Lincoln Building, 60 East 42nd Street, New York City.

Paasche Airbrush Company, Chicago, Ill., has established an export department, with **W. L. Urquhart** as export sales manager, and offices at 11 West 42nd Street, New York City. The company states this branch of its business has grown very rapidly.

Norton Company, Ltd., Chippawa, Ont., abrasive manufacturer, has under construction five new buildings, as follows: 2½-story office, research office, research furnace and laboratory building, ore storage, semi-commercial plant. **J. B. Glaze** is resident manager.

The Harshaw Chemical Company, Cleveland, Ohio, manufacturers of plating supplies, chemicals, etc., announces the opening of its St. Louis offices at 4908 Delmar Boulevard, St. Louis, Mo.; telephone Forest 2572. **Robert Galbraith,** sales manager, is in charge.

Richard B. Carran and Sons Company, Ludlow, Ky., brass foundry operators, have awarded general contract for a 2-story building, 50 by 56 feet, to be used as a furnace room. According to **Sam S. Carran,** it will increase the firm's melting capacity to 75,000 pounds of metal daily. Most of the equipment has been purchased.

Kawneer Company, Niles, Mich., manufacturers of bronze door fronts, windows, etc., have purchased the business of the **Adelbert Coleman Architectural Metal Work Company,** Chicago, Ill., formerly known as the **Chicago Ornamental Iron Works.** The acquired firm will be operated as the Adelbert Coleman Company. The Kawneer Company recently acquired the **Zouri Drawn Metals Company,** Chicago Heights, Ill., now operating as the **Zouri Company.**

Brown Instrument Company, Philadelphia, Pa., has let a contract for construction of 40,000 square feet of additional plant floor space, required to accommodate the increasing demand for pyrometers, flow meters and other industrial instruments the company manufactures. **W. E. Camp,** industrial engineer, is in charge of the work, which consists of adding two new floors on all of the new 2-story concrete sections added to the company's plant in 1928 and 1929.

The Gustave Fox Company, Cincinnati, Ohio, manufacturers of embossed and enameled name plates, emblems, automotive insignia, etc., has changed its name to **Fox Company** for the purpose of brevity. No change in personnel has been made or contemplated. At the same time, the company announces the introduction of a new and simple device for holding automobile club plates on cars where radiator shutters or covers make it difficult to attach them to the radiators. It consists of a pressed metal tab which fastens under the license plate bolt.

Niagara Falls Smelting and Refining Corporation, Buffalo, N. Y., has purchased the **Eureka Products Corporation,** North East, Pa., and the **Orco Manufacturing Corporation,** Buffalo, N. Y., and will merge the three firms, the consolidation to operate under the name of the purchasing concern, of which **Ernest J. Jarvis** is president and general manager. The company is a large manufacturer of special non-ferrous alloys, ingot metals, such as brass, bronze and aluminum and other white metals. Melting, refining, machining, forging, stamping and other departments are operated.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

JULY 1, 1930.

As was to be expected, domestic copper buying during the month of June was very light. The price of copper reached a low of 11½ cents and then rallied to 12 cents. While domestic purchases were small, export business was good, with several days when fairly large sales were made. Because of the large purchases of copper made during May for future delivery, another large buying wave will not logically occur until September or October, or even later. Last month it was estimated that stocks at the end of May would total between 100,000 and 150,000 tons. It should have been stated that the total unsold stocks were estimated at this figure. It is estimated that the total unsold stocks of copper at the end of June amounted to about 150,000 or 175,000 tons.

The brass mills are believed to be operating at between 65 per cent and 70 per cent of last year's rate. From present indications they will soon be operating at a higher rate because business as gauged by the orders placed with brass mills has positively improved. Whether it will continue so, increase, or again sag off is anyone's guess. Stocks of fabricated products are extremely low and with prices at the bottom it is believed we have reached the stage from which slow improvement may be expected. The price of copper is about at the cost of production and is not expected to go lower. It is of course possible that odd lots, possibly of considerable size, may be dumped at concessions, but they will not represent a general price level for the metal and will not effect prices for fabricated products.

That stocks are low and that some items are entirely out of stock is a good indication. There exists right now a demand for products that are entirely out of stock, and if it continues it will sooner or later start a buying movement for such products. It is but logical to expect that the country's needs have about used up excess stocks of products and that we are due now, or within the next month or so, for a good buying wave. This is true not only of the metal business but of all lines of industry in general.

The demand for rolled nickel and Monel is holding up fairly well but has shown a slight falling off from peak demands. However, if any volume buying develops, one's requirements should be anticipated or early deliveries need not be expected. The demand for nickel in ingot or shot form has fallen off somewhat because of the curtailed demand for steel and iron using it.

The demand for aluminum is fair to good. The price has just been reduced 1 cent a pound, which is the first price change in over a year. The tariff on aluminum has also been reduced 1 cent a pound.

Looking at the whole situation, it is believed that we are almost, if not at, the bottom of the recession. From here sporadic improvement and curtailment may be expected. In other words, we are in a period of uncertainty which can almost overnight improve or slip off. However, unless we are to go to the bottomless pit, it is not believed that the situation will get very much worse but with time will gradually improve so that by next year industrial activity will compare favorably with the past five years' average.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

JULY 1, 1930.

The action of the copper market in June could hardly be called satisfactory to either sellers or buyers. After the immense tonnage sold in May, much of it at 13 cents domestic delivery and 13.30 cents c. i. f. European ports, prices showed erratic movements lately, with sales at a new low for several years. Early in first half of June business was done at 11½ cents, this level marking the low point since 1921. As a result of this dip in price, demand gained new momentum and the market had a quick rally to 12 cents for domestic delivery. There was considerable price irregularity for several days as custom smelters sought a market for product handled on basis terms. A good sized tonnage was disposed of which relieved the selling pressure for the time being.

Under the influence of unsettled conditions and prevailing depression the export price was reduced to 12.30 c. i. f. European ports. Total sales to foreign consumers during June were in substantial volume, but the situation both here and abroad continued to reflect a disposition to await definite indications of what changes to expect during the next few weeks. Stocks of copper here are the largest since 1921 but the market price in June touched a point within a fraction of a cent of the lowest quotation in the last 30 years. Copper is on the bargain counter, and the turning point is not only due but overdue.

ZINC

New lows in the zinc market since 1921 marked the movements in June. The weakness of the situation has been a prominent feature for a long time, and there is no real constructive development to arouse strong resistance to present unfavorable conditions. The industry has experienced a steadily growing burden of oversupply. This is now an acute problem, with stocks amounting to 101,744 tons on June 1, the largest in history, and an increase of 5,291 tons compared with the figures on May 1. The market was consequently sensitive to this condition, and prices continued to work lower until Prime Western was offered at 4.20c. East St. Louis. Concessions were being quietly made during last half of month resulting in substantial sales on the down scale. Caution in placing new business has been the rule, and this is natural in view of the heavy stocks and large production.

TIN

A further contraction in market values developed during the past month driving prices down to the lowest level since 1922. The situation has had to contend with a steadily growing burden of oversupply. Visible supplies of tin increased to 39,771 tons on June 1, being 3,176 tons larger than on May 1. Compared with a year ago the figures show a gain of 15,006 tons. At the beginning of month Straits tin was quoted at 30¾c for prompt delivery, but before the middle of the month selling pressure resulted in the market breaking to a new low of 29½c, the lowest level since 1922 when the bottom price was 28¾c. Prices of spot tin in London declined to the lowest since 1914. The industry in the Straits Settlements and Malay States has been geared up to a high rate of output. Despite the talk of drastic restriction of production going into force by agreement or otherwise, the actual situation does not furnish the stimulus for a fair degree of market stability. Obviously a large proportion of the heavy carryover will have to be absorbed before the position of tin will become sound enough to promote the growth of general confidence. Market tendencies near end of the month were irregular and unsettled. Speculative operations at London were confusing, and sentiment both here and abroad gave evidence of shifting about rather erratically. The latest item of news is to the effect that there is to be a world-wide restriction of tin output, including a two month cessation of production in all important fields and a program of 20% restriction.

LEAD

Trading volume in lead was fairly good last month, but buying was spasmodic and did not hold up consistently enough to counteract the downward tendency which finally developed in the last half of June. There were two price reductions during the last half of the month which placed the New York market on the basis of 5.25c, the lowest price since 1922. The lower level was based in large measure by an increase in surplus stocks. World output of lead in May totaled 155,233 tons, against 153,265 tons in April. Stocks of lead on hand in the United States on June 1 amounted to 49,638 tons, against 42,015 tons on May 1, an increase of 7,623 tons. The low prices have proved attractive to some of the leading consumers, with bookings reported for July and early August requirements.

ALUMINUM

Downward revision of prices for aluminum is in accord with the trend of the times for many other commodities. The leading producer made a reduction of one cent a pound on ingot and rolled products the latter part of June, thus breaking the rigid price schedule which continued in force about two and a half years. The new prices are 23.30c for "Alcoa" commercial 99% plus; 22.90c for "Alcoa" metallurgical, 98-99% and 21.30c for "Alcoa" metallurgical 94%. The reduction was apparently prompted by the lower tariff rate of 4 cents a pound instead of 5 cents duty under the old import basis. Virgin aluminum is now selling at the lowest price since 1922. American producers are finding an increasing outlet for their product in India and Japan. European makers, however, are eagerly cultivating trade in Asiatic countries.

ANTIMONY

Easier conditions developed in antimony lately and prices gradually sagged to the level of 7 cents, duty paid, for 99% Chinese regulus. Buying interest was confined to limited quantities. Conditions were not very active. Concessions either on price or quantity might be necessary to create interest, although there was no selling pressure apparent by Chinese shippers. The market is now 2¼c per pound below the high this year. Receding silver prices have exerted a depressing effect on antimony values. Production in Hunan Province, China, during the first three months of this year was reported at 4,100 long tons, against 4,200 tons in the preceding quarter.

QUICKSILVER

Inquiry for quicksilver was more active recently, but sales were moderate. Prices were holding firm, however, at $120 to $121 per flask, although the higher tendency appeared checked for the present.

PLATINUM

A steady tone has prevailed for this article lately, with quotations of $44 to $45 per ounce for the refined metal. Recent reports were to the effect that producers were in agreement to maintain prices at the present level for a time, with the probability of an advance later.

SILVER

The silver market has had the worst setback in the history of the white metal. The New York quotations was down to 33¼ cents per ounce in the latter half of June. There was fairly substantial buying in this market, but weakness in London was a conspicuous feature. Selling for Continental account through London operators was heard of, but China and India demand was too restricted to furnish pronounced support to a weak situation. World production continues high, though less than it was early in the year. Total world output of silver in 1929 amounted to 261,265,718 ounces, against 254,869,163 ounces in 1928 and 253,121,265 ounces in 1927, according to the American Bureau of Metal Statistics. A recent survey of the subject by the United States Bureau of Mines shows that the world production of silver from 1493 to 1927, inclusive, has been over 14,000,000,000 ounces, or about fourteen times the weight of gold produced in the same period.

OLD METALS

With new refined copper at 12 cents a pound the supply of copper and brass grades of scrap are now so much in evidence at the low figures named by dealers for secondary material. Holders are reluctant to sell at prices obtainable for selected grades. Other grades of scrap are easy and operations are on a restricted scale. Dealers quote as buying prices 9½c to 9¾c for strictly crucible copper, 8½c to 8¾c for ordinary heavy copper and wire, 7¾c to 8c for light copper, 6¾c to 7c for new brass clippings, 3½c for light brass, 3¾c to 4c for heavy lead and 13½c to 14c for aluminum clippings.

Daily Metal Prices for the Month of June, 1930

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2	3	4	5	6	9	10	11	12	13	16	17
Copper c/lb. Duty Free												
Lake (Del.)	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	12.50	12.125	12.125	11.75
Electrolytic (f. a. s. N. Y.)	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	12.50	12.25	12.00	11.75
Casting (f. o. b. refinery)	12.625	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.25	11.75	11.75	11.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.65	4.65	4.65	4.65	4.60	4.60	4.60	4.575	4.527	4.50	4.50	4.475
Brass Special	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.625	4.575	4.55	4.55	4.525
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	30.75	30.15	30.25	30.60	30.875	30.875	30.375	30.00	29.75	29.50	29.50	29.50
Pig 99%	30.00	29.40	29.625	30.00	30.25	30.25	29.75	29.375	29.00	28.875	28.875	28.875
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.30
Aluminum c/lb. Duty 4c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.25	7.20	7.125	7.125	7.125	7.10	7.10	7.10	7.10	7.10	7.10	7.10
Silver c/oz. Troy Duty Free	36.375	35.00	34.00	36.125	35.625	36.375	36.625	35.25	35.125	34.875	33.625	34.125
Platinum $/oz. Troy Duty Free	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00

	18	19	20	23	24	25	26	27	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	11.75	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	13.00	11.75	12.393
Electrolytic (f. a. s. N. Y.)	11.75	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	13.00	11.75	12.393
Casting (f. o. b. refinery)	11.50	11.75	11.75	11.75	11.75	11.50	11.50	11.50	11.50	12.625	11.50	11.994
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.40	4.375	4.35	4.325	4.30	4.225	4.20	4.15	4.125	4.65	4.125	4.449
Brass Special	4.45	4.425	4.40	4.375	4.35	4.275	4.25	4.20	4.175	4.70	4.175	4.499
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	29.80	31.00	30.375	29.80	30.50	31.125	30.50	30.875	30.25	31.125	29.50	30.302
Pig 99%	29.20	30.375	29.75	29.10	29.875	30.50	29.75	30.125	29.50	30.50	28.875	29.640
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.30	5.30	5.30	5.15	5.15	5.15	5.15	5.15	5.15	5.40	5.15	5.310
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	23.30	23.30	23.30	24.30	23.30	24.157
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.10	7.10	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.25	7.00	7.082
Silver c/oz. Troy Duty Free	34.00	34.125	33.75	33.625	33.375	33.625	33.625	34.125	33.625	36.625	33.375	34.619
Platinum $/oz. Troy Duty Free	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00

Metal Prices, July 7, 1930

NEW METALS

Copper: Lake, 11.625. Electrolytic, 11.50. Casting, 11.25.
Zinc: Prime Western, 4.15. Brass Special, 4.20.
Tin: Straits, 29.875. Pig, 99%, 29.25.
Lead: 5.15. **Aluminum,** 23.30. **Antimony,** 7.00.
Nickel: Ingot, 35. Shot, 36. Elec., 35. **Pellets,** 40.
Quicksilver: flask, 75 lbs., $120.00. **Bismuth,** $1.00.
Cadmium, 70. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy (N. Y. official price July 7), 34.00.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $45.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¼to11
Brass Ingots, Red	11¼to13
Bronze Ingots	12½to14
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	22 to37
Manganese Bronze Ingots	10½to15
Manganese Bronze Forgings	35 to43
Manganese Copper, 30%	23 to30
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	16½to18
Phosphor Copper, guaranteed 10%	15½to17
Phosphor Tin, no guarantee	39 to45
Silicon Copper, 10%, according to quantity	25 to35

OLD METALS

Buying Prices		Selling Prices
11.00to11.25	Strictly Crucible Copper	12.00to12.25
10.25to10.75	Heavy Copper and Wire	11.25to11.75
9.75to10.00	Light Copper	10.75to11.00
6.50to 6.75	Heavy Brass	7.50to 7.75
5.50to 5.75	Light Brass	6.50to 6.75
8.75to 9.00	No. 1 Composition	9.75to10.00
8.00to 8.25	New Composition Turnings	9.00to 9.25
4.00	Heavy Lead	5.00
2.00to 2.25	Old Zinc	3.00to 3.25
3.00to 3.25	New Zinc Clips	4.00to 4.25
14.25to14.50	Aluminum Clips (new)	18.00to19.00
8.75to 9.25	Scrap Aluminum, cast alloyed	12.00to14.00
10.25to10.50	Scrap Aluminum sheet (old)	12.00to13.00
24to26	No. 1 Pewter	20to30
20to21	Old Nickel Anodes	22to23
15to23	Old Nickel	17to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....21¾c. to 22¾c. net base
Front Stock .....22¾c. to 23¾c. net base

BARE COPPER WIRE

13⅝c. to 13¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order.....20¼c. net base
100 lbs. to 300 lbs. in one order.....20¾c. net base

ZINC SHEET

	Cents per lb.
Duty on sheet, 2c. per lb.	
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	Net Base 10.00
Casks, jobbers' price	10.25
Open casks, jobbers' price	11.00 to 11.25

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb. 32.30
Aluminum coils, 24 ga., base price 30.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver (July 7) 36.75c., Troy oz., upward according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect June 17, 1930
To customers who buy 5,000 lbs. or more in one order

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¾	$0.20⅛	$0.21⅛
Wire	.19¼	.20⅝	.21⅝
Rod	.17	.20⅝	.21⅝
Brazed tubing	.26¼	.....	.30⅝
Open seam tubing	.26¾	.....	.28⅞
Angles and channels	.26¾	.....	.28⅞

BRASS SEAMLESS TUBING

23¾c. to 24¾c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	20¾c. net base
Muntz or Yellow Rectangular sheet other sheathing	20¾c. net base
Muntz or Yellow Metal Rod	18c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26½c.	10% Quality	29½c.
15% Quality	28¼c.	15% Quality	33¼c.
18% Quality	29¾c.	18% Quality	36¾c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, July 7, 1930

ANODES

Copper: Cast	25⅜c. per lb.	Nickel: 90-92%	45c. per lb.
Rolled, oval	22⅛c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	22¼c. per lb.	99%	49c. per lb.
Brass: Cast	24⅜c. per lb.	Silver: Rolled silver anodes .999 fine were quoted July 7 from 37c. per Troy ounce upward, depending upon quantity.	
Zinc: Cast	11¾c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Opens buffs, per 100 sections.

11" 20 ply 64/68 Unbleached	$20.94 to 26.85
14" 20 ply 64/68 Unbleached	31.09 to 39.86
11" 20 ply 80/92 Unbleached	24.39 to 31.27
14" 20 ply 80/92 Unbleached	35.94 to 46.07
11" 20 ply 84/92 Unbleached	35.19 to 46.59
14" 20 ply 84/92 Unbleached	50.20 to 66.93
11" 20 ply 80/84 Unbleached	31.38 to 40.23
14" 20 ply 80/84 Unbleached	46.53 to 59.64
Sewed Pieced Buffs, per lb., bleached	33c. to 79c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.18	Lacquer Solvents	gal.	.85
Acid—Boric (Boracic) Crystals	lb.	.08½	Lead Acetate (Sugar of Lead)	lb.	.13¼
Chromic, 75 to 400 lb. drums	lb.	.18-.21	Yellow Oxide (Litharge)	lb.	.12½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02	Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Hydrochloric, C. P., 20 deg., carboys	lb	.06	Nickel—Carbonate, dry bbls.	lb.	.35
Hydrofluoric, 30%, bbls	lb.	.08	Chloride, bbls.	lb.	.20
Nitric, 36 deg., carboys	lb.	.06	Salts, single, 300 lb. bbls.	lb.	.12½-.13
Nitric, 42 deg., carboys	lb.	.07	Salts, double, 425 lb. bbls.	lb.	.12½-.13
Sulphuric, 66 deg., carboys	lb.	.02	Paraffin	lb.	.05-.06
Alcohol—Butyl	lb.	.16¾-.21¼	Phosphorus—Duty free, according to quantity	lb.	.35-.40
Denatured, drums	gal.	.42-60	Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.093
Alum—Lump, barrels	lb.	.0325	Potassium Bichromate, casks (crystals)	lb.	.09¼
Powdered, barrels	lb.	.039	Carbonate, 96-98%	lb.	.06¼-.07
Ammonium chloride, solution in carboys	lb.	.06½	Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Ammonium—sulphate, tech., bbls	lb.	3.3	Pumice, ground, bbls.	lb.	.02½
Sulphocyanide	lb.	.65	Quartz, powdered	ton	$30.00
Arsenic, white, kegs	lb	.05	Rosin, bbls.	lb.	.04½
Asphaltum	lb.	.35	Rouge, nickel, 100 lb. lots	lb.	.25
Benzol, pure	gal.	.60	Silver and Gold	lb.	.65
Borax Crystals (Sodium Biborate), bbls	lb.	.04½	Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Calcium Carbonate (Precipitated Chalk)	lb.	.04	Silver Chloride, dry, 100 oz. lots	oz.	.29¾
Carbon Bisulphide, Drums	lb.	.06	Cyanide (fluctuating)	oz.	.42-.47½
Chrome Green, bbls.	lb.	.25	Nitrate, 100 ounce lots	oz.	.26
Chromic Sulphate	lb.	.30-.40	Soda Ash, 58%, bbls.	lb.	.02½
Copper—Acetate (Verdigris)	lb.	.23	Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17
Carbonate, bbls.	lb.	.20½	Hyposulphite, kegs	lb.	.04
Cyanide (100 lb. kgs)	lb.	.45	Nitrate, tech., bbls.	lb.	.04¾
Sulphate, bbls.	lb.	5.2	Phosphate, tech., bbls.	lb.	.03¾
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27	Silicate (Water Glass), bbls.	lb.	.02
Crocus	lb.	.15	Sulpho Cyanide	lb.	.32½-.42½
Dextrin	lb.	.05-.08	Sulphur (Brimstone), bbls.	lb.	.02
Emery Flour	lb.	.06	Tin Chloride, 100 lb. kegs	lb.	.32
Flint, powdered	ton	$30.00	Tripoli, Powdered	lb.	.03
Fluor-spar (Calcic fluoride)	ton	$70.00	Wax—Bees, white, ref. bleached	lb.	.60
Fusel Oil	gal.	$4.45	Yellow, No. 1	lb.	.45
Gold Chloride	oz.	$12.00	Whiting, Bolted	lb.	.02½-.06
Gum—Sandarac	lb.	.26	Zinc, Carbonate, bbls.	lb.	.11
Shellac	lb.	.59-.61	Chloride, casks	lb.	.06¾
Iron Sulphate (Copperas), bbl.	lb.	.01½	Cyanide (100 lb. kegs)	lb.	.41
			Sulphate, bbls.	lb.	.03½